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SNOW FENCES OF VARIOUS HEIGHTS

Final Report

U. S. Forest Service Contract No. 16-76

June 1967

A

Report

by

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VELOCITY REDUCTION

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SNOW FENCES OF VARIOUS HEIGHTS

Final Report

U. S. Forest Service Contract No. 16-76

June 1967

Dr. R. D. Tabler, Research Forester
Rocky Mountain Forest and Range
Experiment Station
U. S. Forest Service
University Station, P. O. Box 3313
Laramie, Wyoming 82070

Dear Sir:

We are pleased to forward herewith our final report on our Contract No. 16-76 with the U. S. Forest Service.

We have greatly appreciated this opportunity to participate in this important and interesting study.

Your many suggestions and valuable contributions to this research effort have been greatly appreciated.

Sincerely,

NATURAL RESOURCES RESEARCH INSTITUTE

Donald L. Veal
Principal Investigator

DLV/jms

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1. INTRODUCTION

The primary objective of this study was to quantify the effect of snow fence height on downstream wind velocity. The secondary objective was to attempt to determine the general location and extent of maximum downstream velocity reduction.

The Pole Mountain area east of Laramie, Wyoming was selected for the study because this area was being used by the U. S. Forest Service, Rocky Mountain Forest and Range Experiment Station, in conjunction with other related studies. Also, the snow fences were constructed and readily available.

2. EQUIPMENT AND FIELD FACILITIES

In order to quantify the effect of snow fences on the ambient wind, it was necessary to determine both the upstream (free stream) and downstream velocity profiles. These velocity profiles were obtained by simultaneously recording data from anemometers placed at various heights on upstream and downstream masts. The anemometers were in general placed 1, 2, H/4, H/2, 3H/4 and H feet above the ground. Two portable masts were designed which provided easy adjustment of anemometer spacing and also were sufficiently mobile so that reasonably rough terrain and snow drifts could easily be negotiated. Each anemometer mast consisted of a vertical channel and three telescoping pipes as shown in Figure 1.

The anemometers used were electric, contact-type, sensitive anemometers[1] manufactured by C. F. Cosella and Co., Ltd.

Velocity data obtained from each anemometer was recorded digitally with electro-mechanical totalizing counters. The counters and anemometers were furnished by the U. S. Forest Service. The necessary power supplies were furnished by the Natural Resources Research Institute and all modifications to the counting equipment and clock were accomplished by NRRI technicians. The recording package is shown on Figure 2.

[1] "Mentioning the name of a manufacturer or his product does not constitute an endorsement or disparagement of the United States Department of Agriculture or the University of Wyoming."

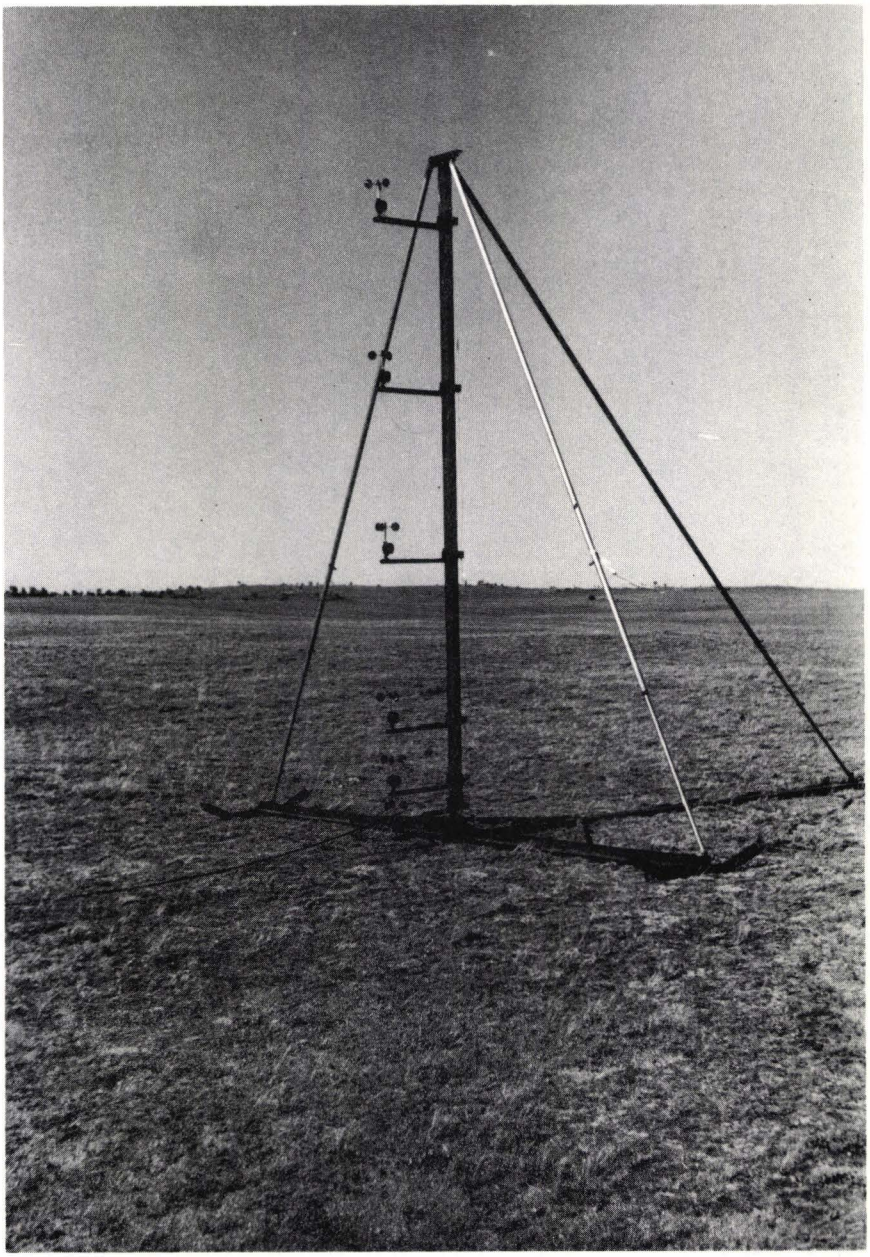


Figure 1. Anemometer Mast

Figure 2. Recording Equipment

To insure that the variation among anemometers measuring the same wind was insignificant, matching runs were made. These matching runs were accomplished by aligning all twelve units at the same elevation above the ground and then operating them for a given period of time, after which time each anemometer was moved one position and again operated for about the same period of time. This procedure was continued until each unit had occupied each position. The set-up used for matching runs is shown on Figure 3.

All snow fences used in this study were the vertical slat-type with 50 percent density. The fences were located and paired as shown in Table I with each section being 10H feet in length. All fences were constructed with a two-foot gap between the fence and ground.

TABLE I

Description of snow fence height study blocks.

		Total Fence Height (H)	
Block No.	Location	North Section	South Section
1.	SE ¼ Sec. 4 T15N., R71W	6	16
2.	NE ¼ Sec. 4 T15N., R71W	8	10
3.	SE ¼ Sec. 4 T15N., R71W	10	16
4.	SE ¼ Sec. 4 T15N., R71W	8	12
5.	NE ¼ Sec. 4 T15N., R71W	6	10
6.	NE ¼ Sec. 4 T15N., R71W	6	8
7.	SW ¼ Sec. 3 T15N., R71W	10	12
8.	NW ¼ Sec. 10 T15N., R71W	12	6
9.	SW ¼ Sec. 2 T15N., R71W	8	16
10.	SE ¼ Sec. 3 T15N., R71W	12	16

Upstream vertical temperature measurements were taken at distances of 1.5, 3, and H feet above the ground. The temperatures were determined from top to bottom by consecutively reading three YSI, 100 ohm @ 25°C., matched thermisters. The unit of resolution of this equipment was $\pm$0.3°C.

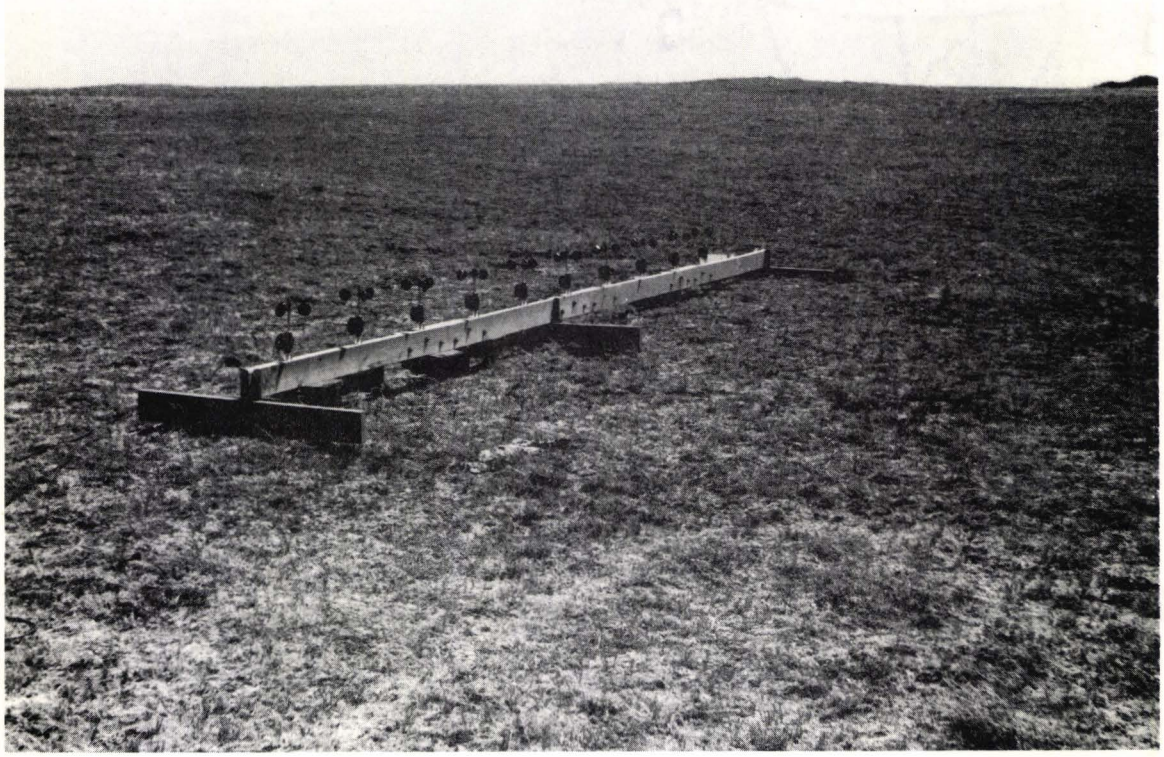


Figure 3. Matching Run Set-Up

3. COLLECTION OF FIELD DATA

Initial velocity profile data were obtained during February and March, 1966 at six different locations downstream from each fence. These locations were 2.5H, 5H, 7.5H, 12.5H and 15H feet, where H is total fence height. Due to the limited time remaining during the first winter's operation for collection of field data only one fence of each height was investigated. As a result of these investigations it was decided to reduce the number of downstream locations to 2.5H, 5H and 10H feet because the angle of attack of the wind beyond 10H appeared to be restrictive. In all cases the upstream velocity profile (upstream 10H) was determined simultaneously with each downstream profile. During November and December, 1966 velocity profiles were determined for all twenty fences under no-snow conditions. Days of measurement were restricted to mean wind velocities of about 12 to 40 mph with the maximum deviation from normal incidence to the fences of approximately 45°. Considerable care was exercised by the field crew to insure that velocity measurements were taken downstream under the influence of the fence. As a result of this restriction the 5H and 10H measurements were eliminated on fence number 1 for both the 6- and 16-foot sections; fence number 3 for the 10-foot section; and the 2.5H, 5H and 10H measurements for fence number 2 for the 8-foot section. The 2.5H data was used since it was generally considered to be satisfactory except for fence number 2.

Air temperature was measured at 1.5, 3, and H feet above the ground at the upstream location. These temperature measurements were taken at least once while obtaining the velocity data on each fence. The temperature data are shown plotted, on the appropriate profile which temporally coincided, for both snow and no-snow conditions in the Appendix. In addition all other field data are presented in the Appendix of this report.

4. ANALYSIS

The effect of the fence on ambient wind conditions was evaluated by comparing mean upstream and downstream wind velocity. This comparison

was accomplished by integrating the velocity profiles, determining the mean velocity using one-dimensional continuity, and calculating the percent reduction of the mean velocity. The reduction parameter thus obtained was not biased if the following assumption is valid: That is, if the percent reduction of mean wind velocity is equal to some function of fence height integrated from one to H feet, and that the same parameter is not a different function of height above H or

$$R_{\bar{v}} = f(H)\Big|_{1'}^{H'}, \text{ and } R_{\bar{v}} \neq \phi(H)\Big|_{H'}^{\infty}$$

where $R_{\bar{v}}$ represents the reduction parameter; or, in other words

$$f(H)\Big|_{1'}^{H'} = \phi(H)\Big|_{H'}^{\infty}.$$

The experiment was conducted as a balanced incomplete block design in which the five fence heights represent the treatments. The fences were placed in ten blocks with two fences per block in a manner so that the same pair of fences appears together in only one block. Percent reductions of mean wind velocity are the observations used in the analysis. In all statistical analysis presented in this report a 95 percent significance level was used.

The reduction parameter was evaluated for each fence height at 2.5H, 5H and 10H feet downstream and is shown on Figure 4. Least squares regression lines, using the model $y = a + bx$, are as follows:

(1) $y = 1.82x + 17.20$, $r_{xy} = 0.975$, for 2.5H

(2) $y = 1.80x + 13.79$, $r_{xy} = 0.946$, for 5H

(3) $y = 0.95x + 15.63$, $r_{xy} = 0.709$, for 10H

where y represents Average Percent Reduction of Mean Wind Velocity in mph;

x represents Fence Height; and

r_{xy} represents Correlation Coefficient.

The analysis of variance for these functions reveals no significant lack of fit. The slopes of the lines for 2.5H and 5H are significantly

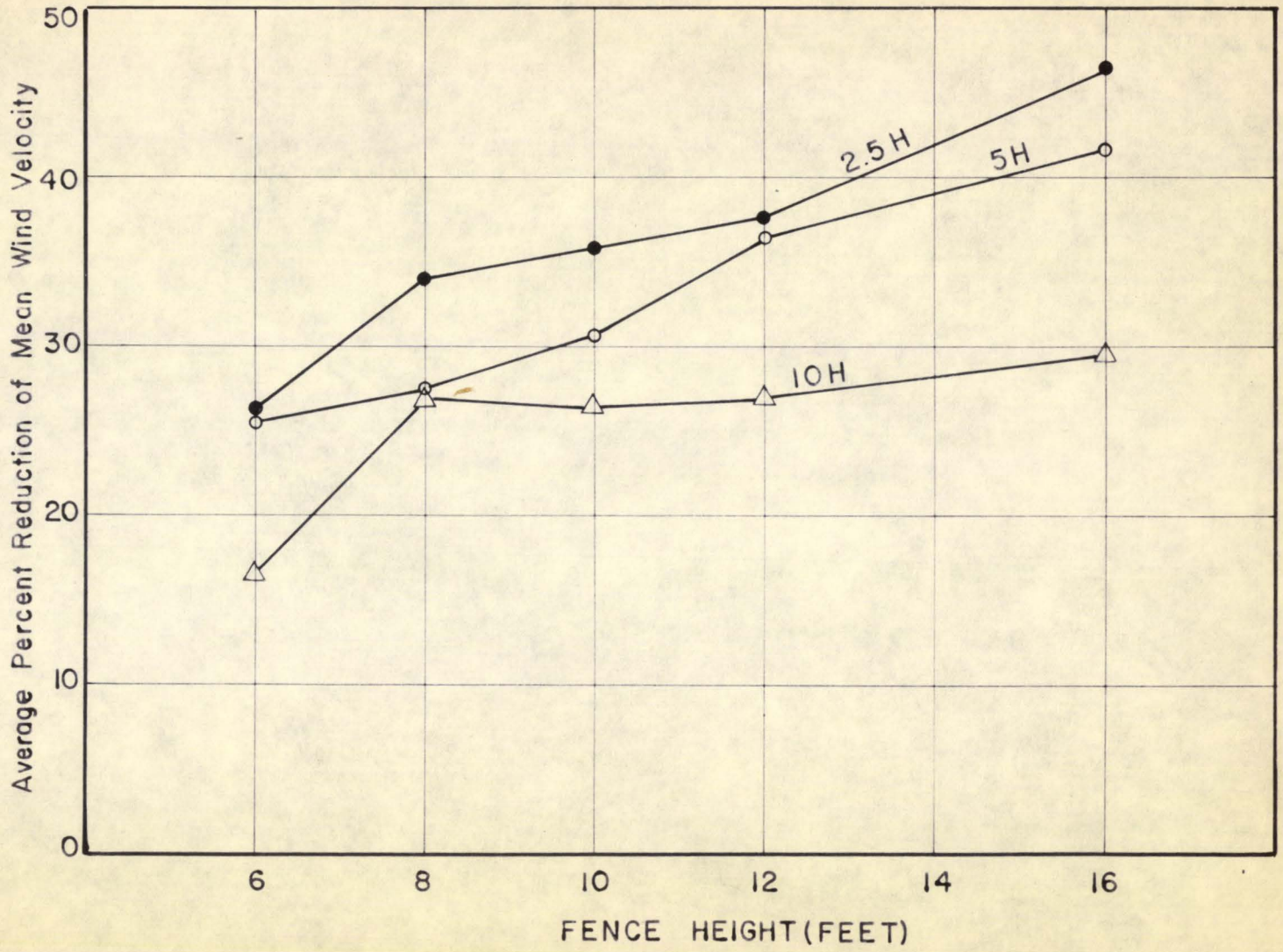

Average Percent Reduction of Mean Wind Velocity
50
40
30
20
10
0
2.5H
5H
10H
6
8
10
12
14
16
FENCE HEIGHT (FEET)

Figure 4

different from zero, while the slope of the 10H line is not significantly different from zero. It is important here to note that the wind direction variability could have affected the 10H data. In order to obtain meaningful 10H measurements, only operational days in which the wind was very nearly normal to the fence should be used.

Percent reductions obtained by averaging the 2.5H and 5H measurements for each fence height are shown on Figure 5. Six observations enter into each point plotted, except for the 12 foot fence, where eight observations were available. The derived function obtained by fitting a least squares regression to the observations is as given in equation (4).

(4) $$y = 1.75x + 18.98, \quad r_{xy} = 0.981$$

where y represents Average Percent Reduction of Mean Wind Velocity in mph;

x represents Fence Height; and

r_{xy} represents Correlation Coefficient.

As an alternative presentation, mean percent reduction for each fence is plotted versus $\frac{KH}{H}$ for K equal to 2.5, 5 and 10 (Figure 6). The points on each curve are the average velocity reductions from three fences, with the exception of the 12 foot fence, which has four observations averaged for each point. A least squares regression line of the form $y = a + bx$ was obtained for each fence height as follows:

(5) $y = 52.76 - 2.32x, \quad r_{xy} = -0.699,$ for 16' fence

(6) $y = 42.57 - 1.51x, \quad r_{xy} = -0.645,$ for 12' fence

(7) $y = 37.90 - 1.22x, \quad r_{xy} = -0.586,$ for 10' fence

(8) $y = 33.61 - 0.66x, \quad r_{xy} = -0.243,$ for 8' fence

(9) $y = 31.08 - 1.40x, \quad r_{xy} = 0.579,$ for 6' fence

where y represents Average Percent Reduction of Mean Wind Velocity in mph;

x represents $\frac{KH}{H}$; and

r_{xy} represents Correlation Coefficient.

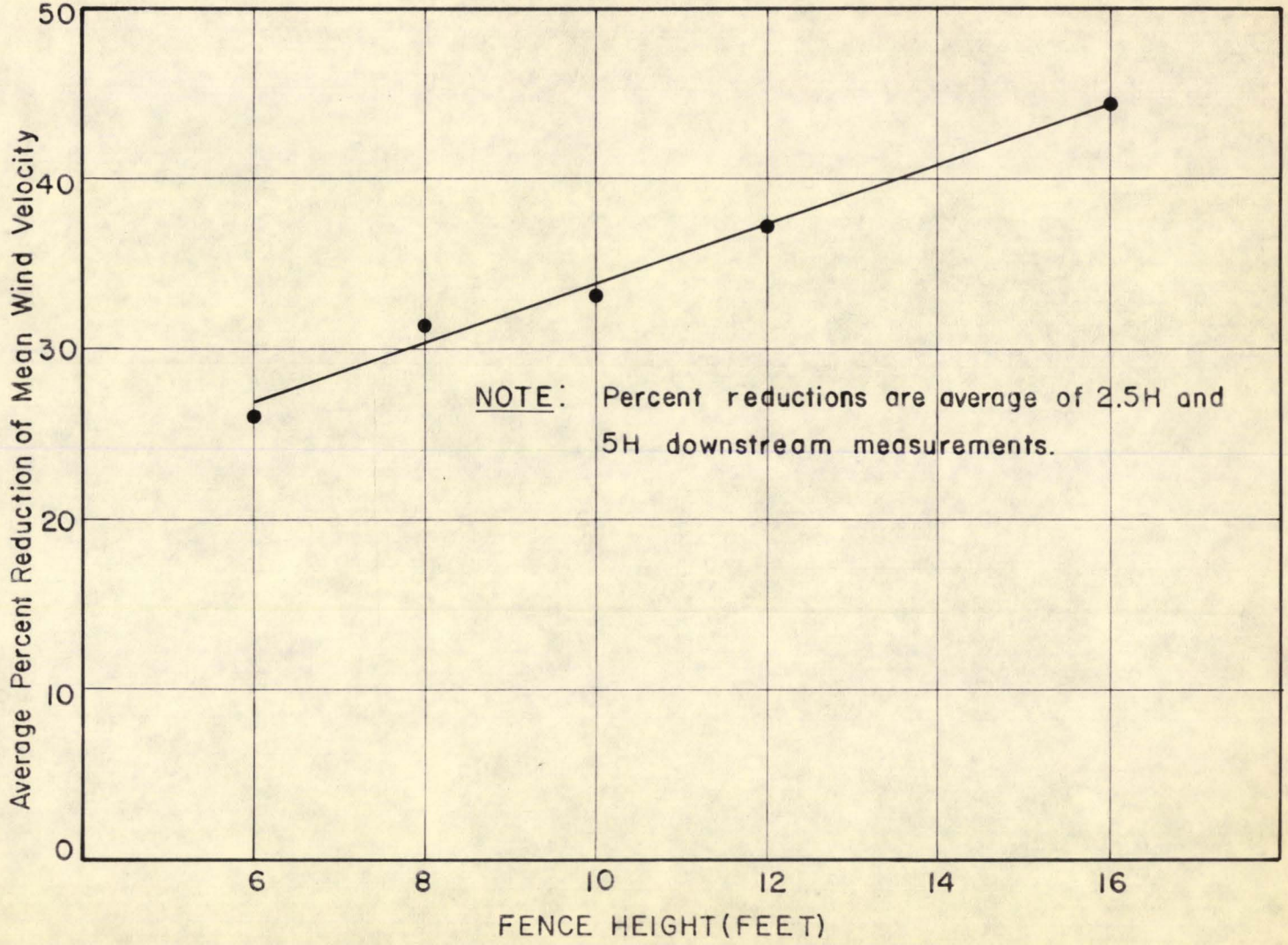

50
40
30
20
10
0
Average Percent Reduction of Mean Wind Velocity
NOTE: Percent reductions are average of 2.5H and 5H downstream measurements.
6
8
10
12
14
16
FENCE HEIGHT (FEET)

Figure 5

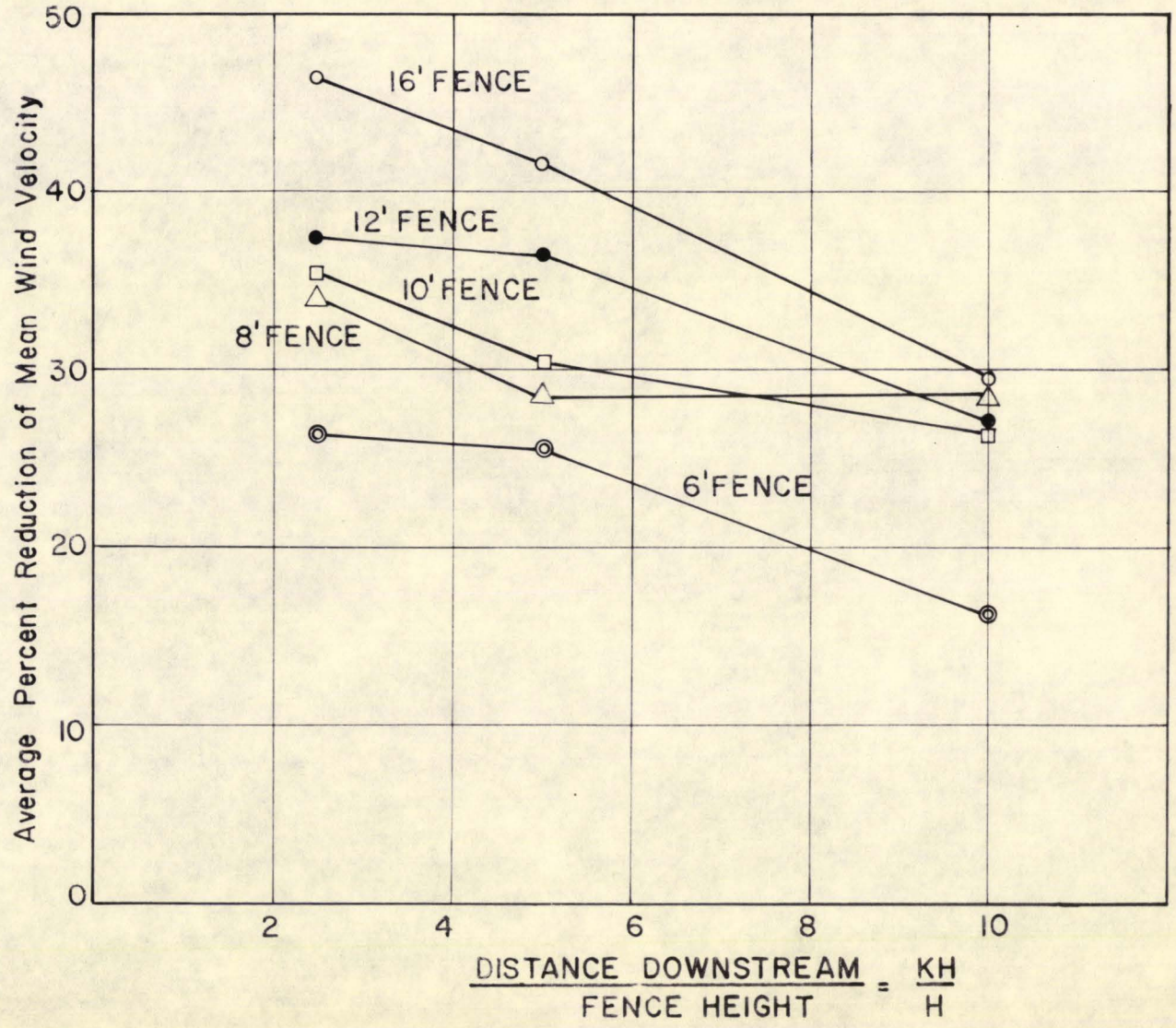

50
40
30
20
10
0
Average Percent Reduction of Mean Wind Velocity
16' FENCE
12' FENCE
10' FENCE
8' FENCE
6' FENCE
2
4
6
8
10
DISTANCE DOWNSTREAM / FENCE HEIGHT = KH / H

Figure 6

Analysis of variance of the functions reveals that the slopes of the 16-foot and 12-foot fences are significantly different from zero, while the slopes of the other functions are not significantly different from zero. There was no lack of fit for any of the lines represented by equations (5) through (9). Similarly, Figure 7 shows average percent reduction as a function of distance downstream for each fence height.

The relationship between velocity reduction and ambient wind was investigated to the extent available data would permit and is shown on Figures 8 through 12. Ambient or free stream wind was defined as that measured by the upstream anemometer 16 feet above the ground. The 16-foot elevation was selected as the index to define the ambient wind since this measurement was available on all fences. If another height were desired (say 3 meters), it could be obtained by interpolation from the data in the Appendix. An examination was made of the correlation between upstream velocity at 16 feet above ground and percent velocity reduction at 2.5H, 5H and 10H downstream for all fence heights. The analysis showed significant correlation for the 6-foot fence and no significant correlation for all remaining fence heights. The correlation coefficients for the fences are as follows:

$$r_{xy} = 0.724, \quad \text{for } 6' \text{ fence}$$

$$r_{xy} = 0.011, \quad \text{for } 8' \text{ fence}$$

$$r_{xy} = 0.545, \quad \text{for } 10' \text{ fence}$$

$$r_{xy} = 0.468, \quad \text{for } 12' \text{ fence}$$

$$r_{xy} = 0.489 \quad \text{for } 16' \text{ fence}$$

Only data from the 2.5H downstream measurements were used in the analysis of variance for the block design. The data for the 5H and 10H measurements were not used because two questionable observations occur in the same block, rendering insufficient information for analysis of variance purposes. The 2.5H data for the 8-foot fence at location two was questionable and therefore this value was estimated, slightly decreasing the accuracy of the analysis. Effects of the fences on the

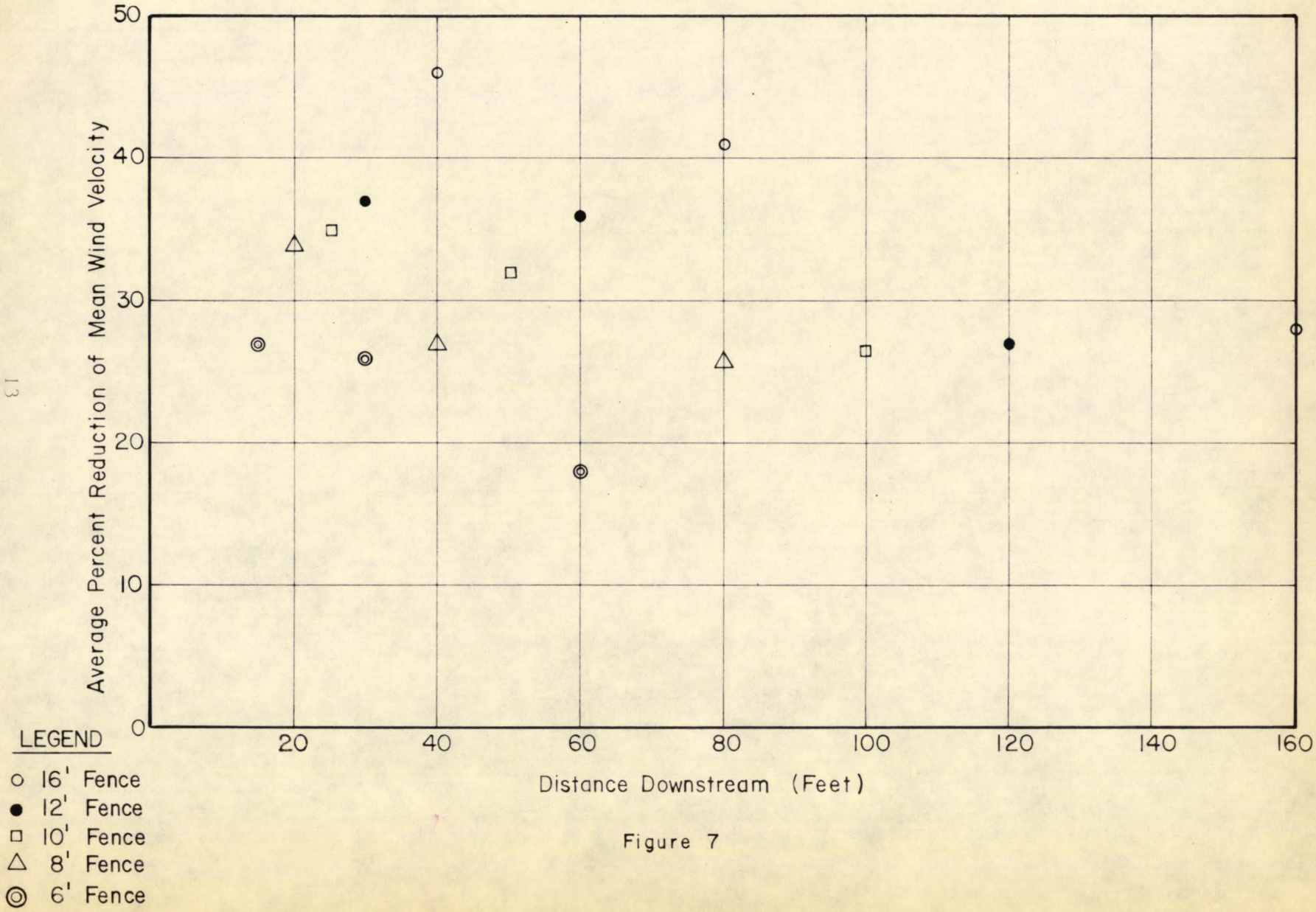
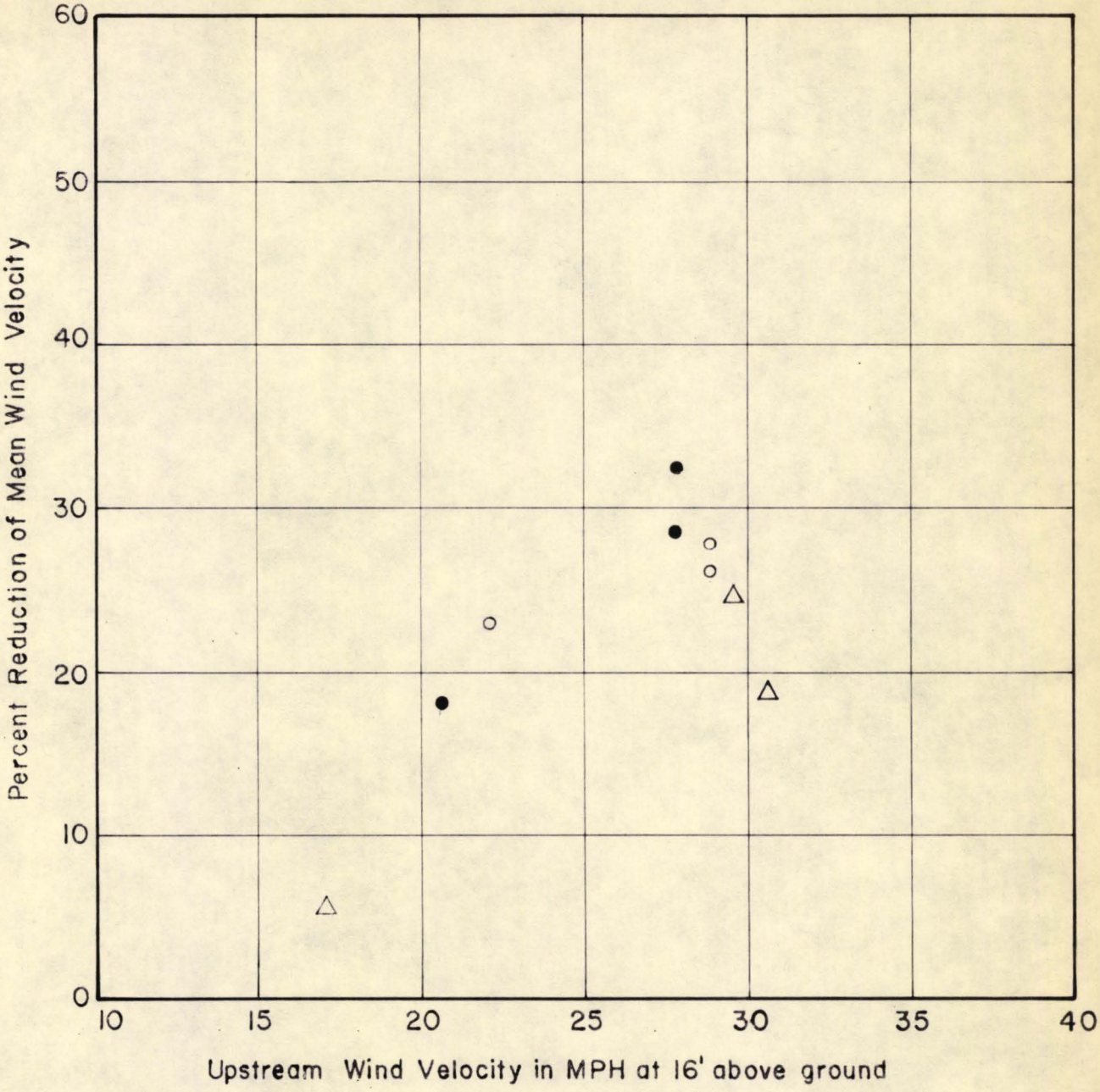

50
40
30
20
10
0
Average Percent Reduction of Mean Wind Velocity
20
40
60
80
100
120
140
160
Distance Downstream (Feet)
LEGEND
16' Fence
12' Fence
10' Fence
8' Fence
6' Fence

Figure 7



LEGEND:

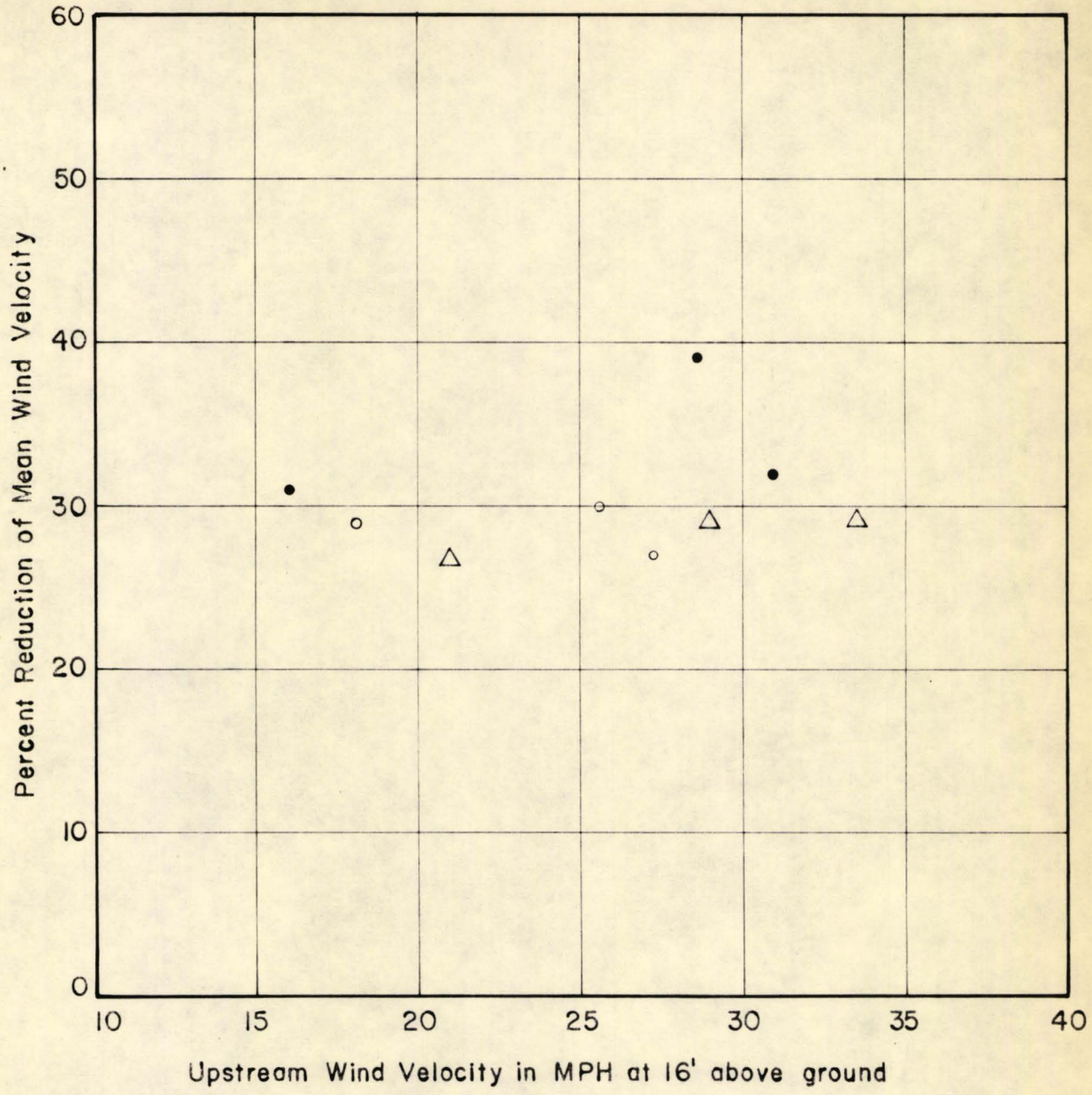
● 2.5H

o 5H

△ 10H

6' FENCE

Figure 8

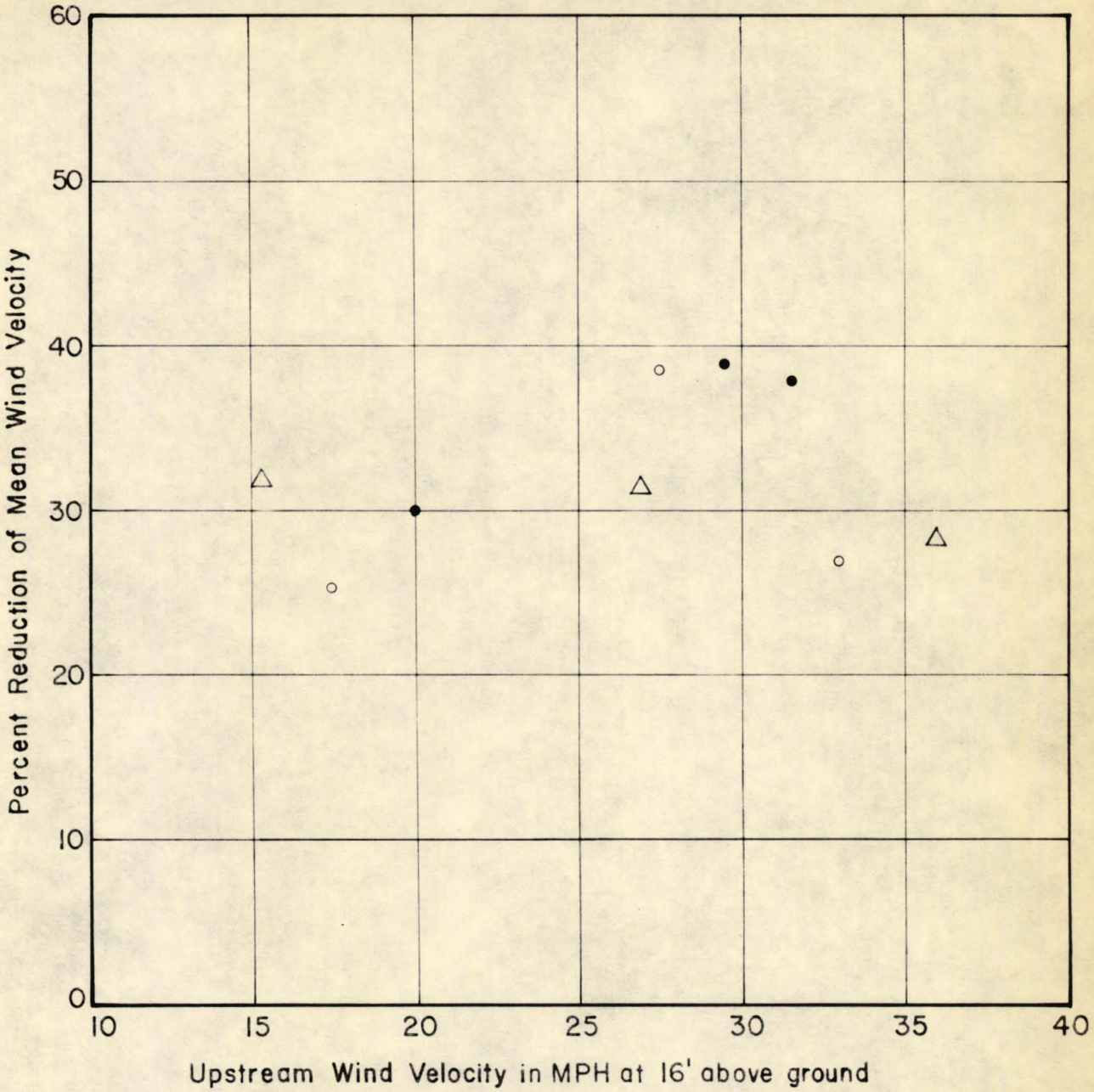


LEGEND:

- ● 2.5 H
- ○ 5H
- △ 10H

8' FENCE

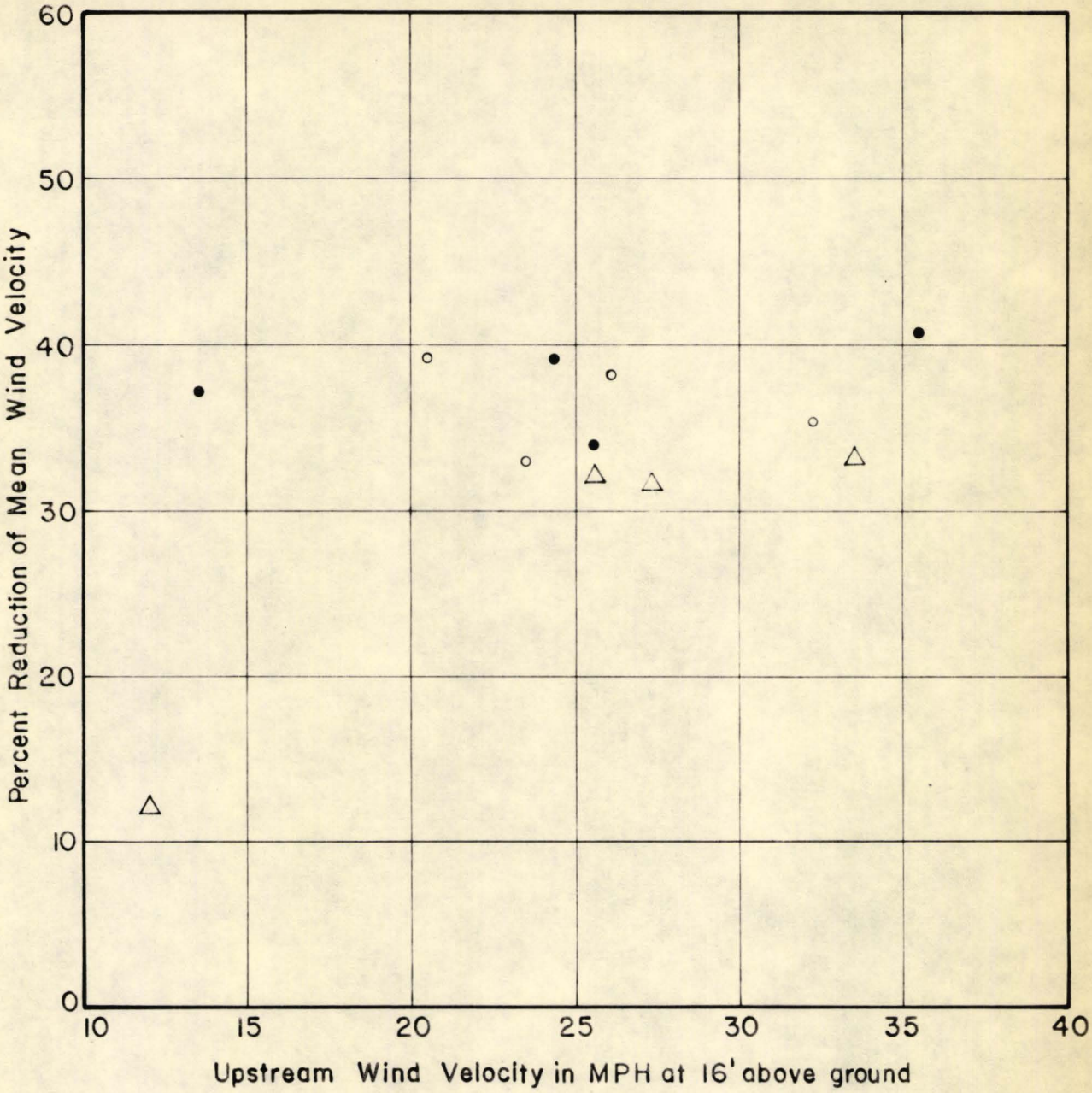
Figure 9



LEGEND:
- ● 2.5H
- ○ 5H
- △ 10H

10' FENCE

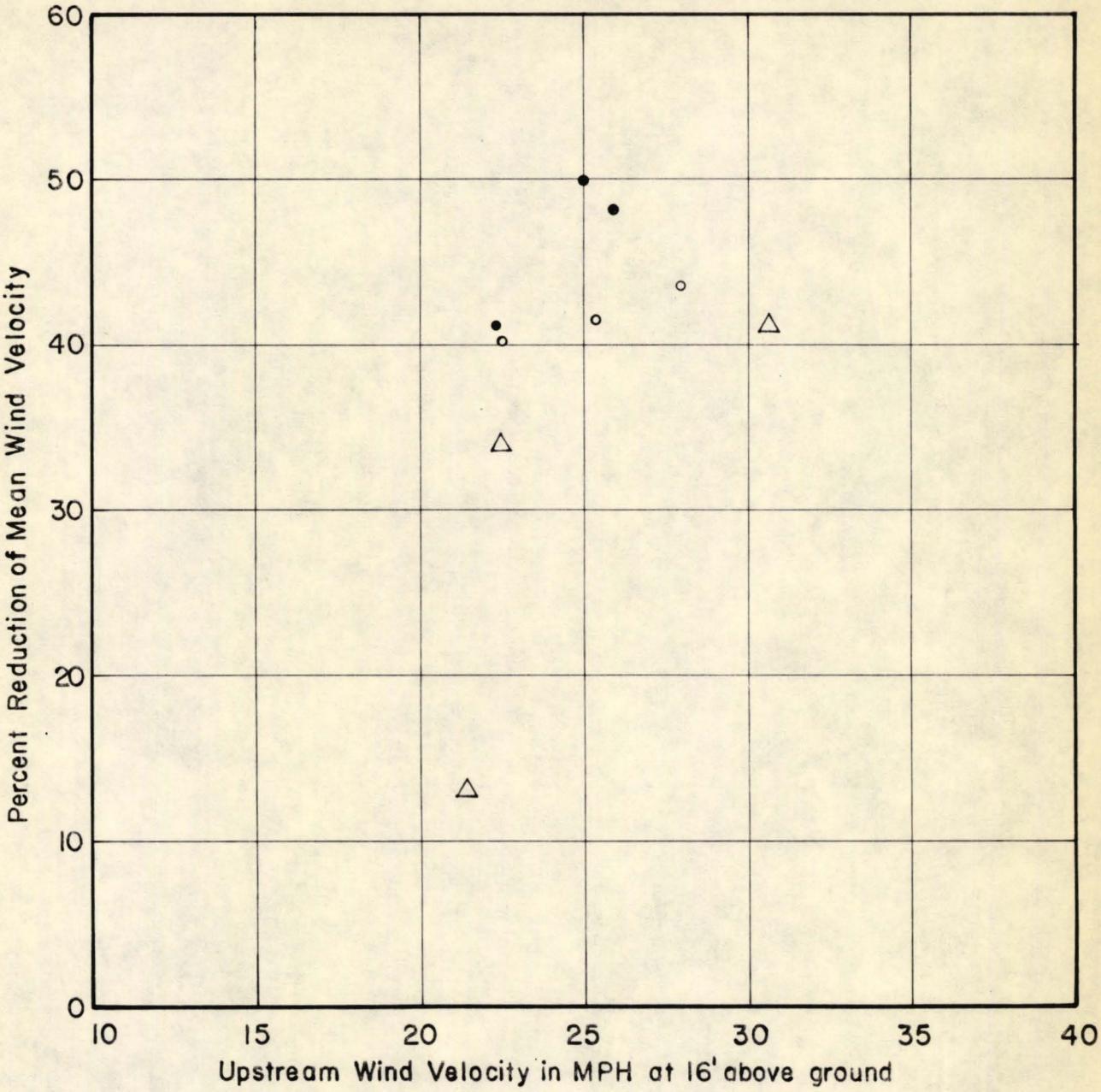
Figure 10



LEGEND:
- ● 2.5H
- ○ 5H
- △ 10H

12' FENCE

Figure 11



LEGEND:

- ● 2.5H
- ○ 5H
- △ 10H

16' FENCE

Figure 12

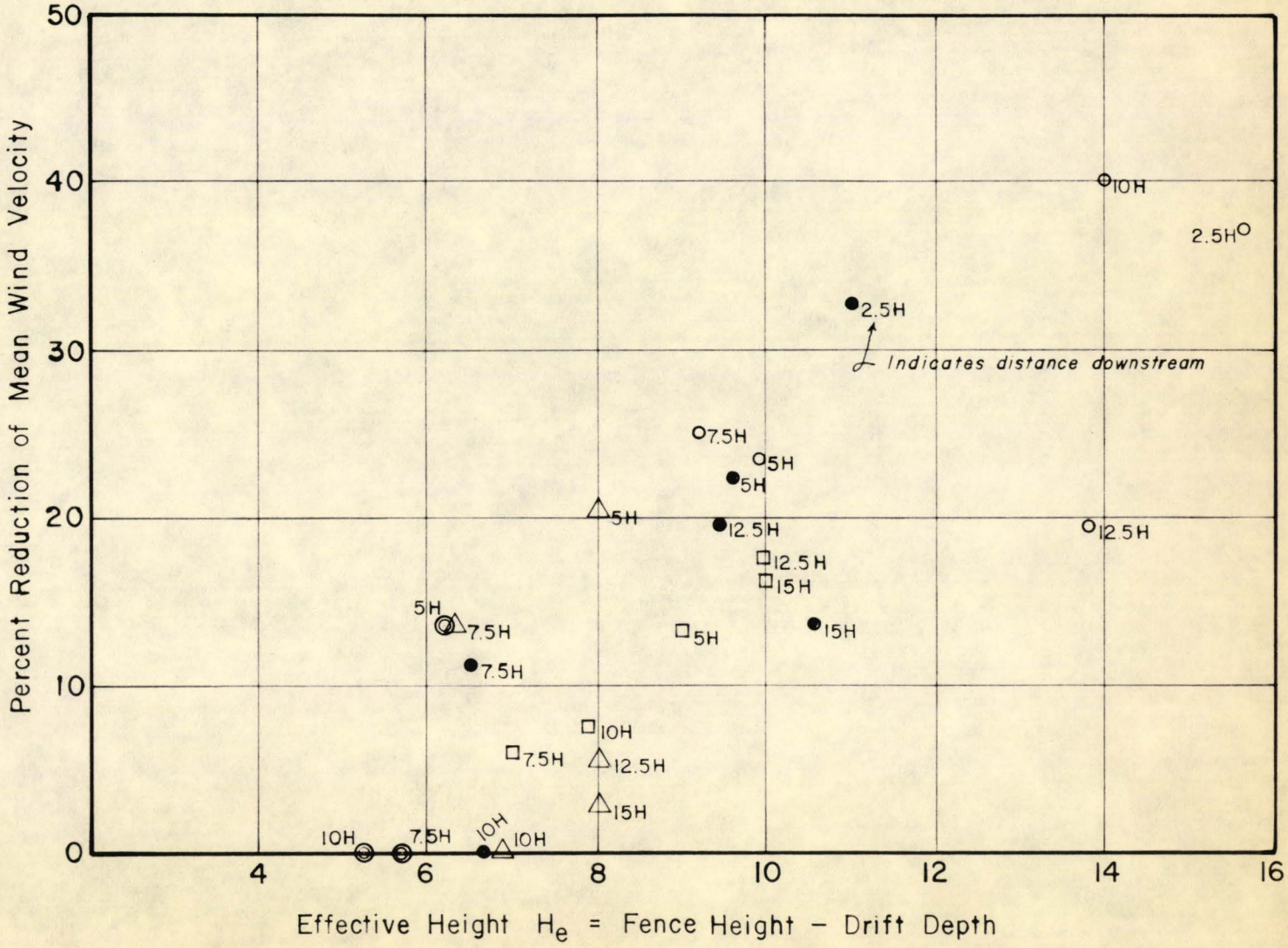
velocity reduction are adjusted for fence position in a block as prescribed by the block design.[1] The analysis indicated that the fences had a significant effect on the velocity reductions. Comparisons were made between treatment effects to determine which fences contributed to the significance of the analysis of the whole experiment. The contrasts showed that the 16 foot fences produced a significantly greater percent velocity reduction than the 6-, 8-, and 10-foot fences. The 12-foot fences also produced a significantly greater reduction than the 6-foot fences.

The same general analysis procedure was followed under conditions in which snow had accumulated behind the fences. An effective height was used to illustrate the effect of snow accumulation behind fences of various heights. Effective height, H_e, is defined as the total fence height minus snow depth. Mean velocity for the effective height was determined from upstream and downstream velocity profiles and used to calculate percent reductions. Percent reduction of mean velocity for various downstream distances and effective heights for the 16, 12, 10, 8 and 6-foot fences is shown on Figure 13. The same general relationship is shown on Figure 14 but includes only the 2.5H, 5H and 7.5H feet downstream measurements. No statistical analysis of these data was attempted because of the limited sample available.

For stability information, upstream vertical temperature profiles were determined at 1.5, 3 and H feet above the ground. Temperature information obtained is shown on the velocity profile corresponding to the time at which is was taken (see Figures 15 through 39 Appendix). This temperature data was obtained by consecutively reading $\pm$0.3°C. resolution thermisters.

An analysis of the variation among anemometers measuring the same wind was accomplished by determining the total wind passing each anemometer for the total matching run time and comparing these results.

[1] The design is given on page 471 of Cochran and Cox (2nd Ed.) under Plan 11.2 (technique of analysis is given on page 449).



LEGEND

- ○ 16' Fence
- ● 12' Fence
- □ 10' Fence
- △ 8' Fence
- ◎ 6' Fence

Figure 13

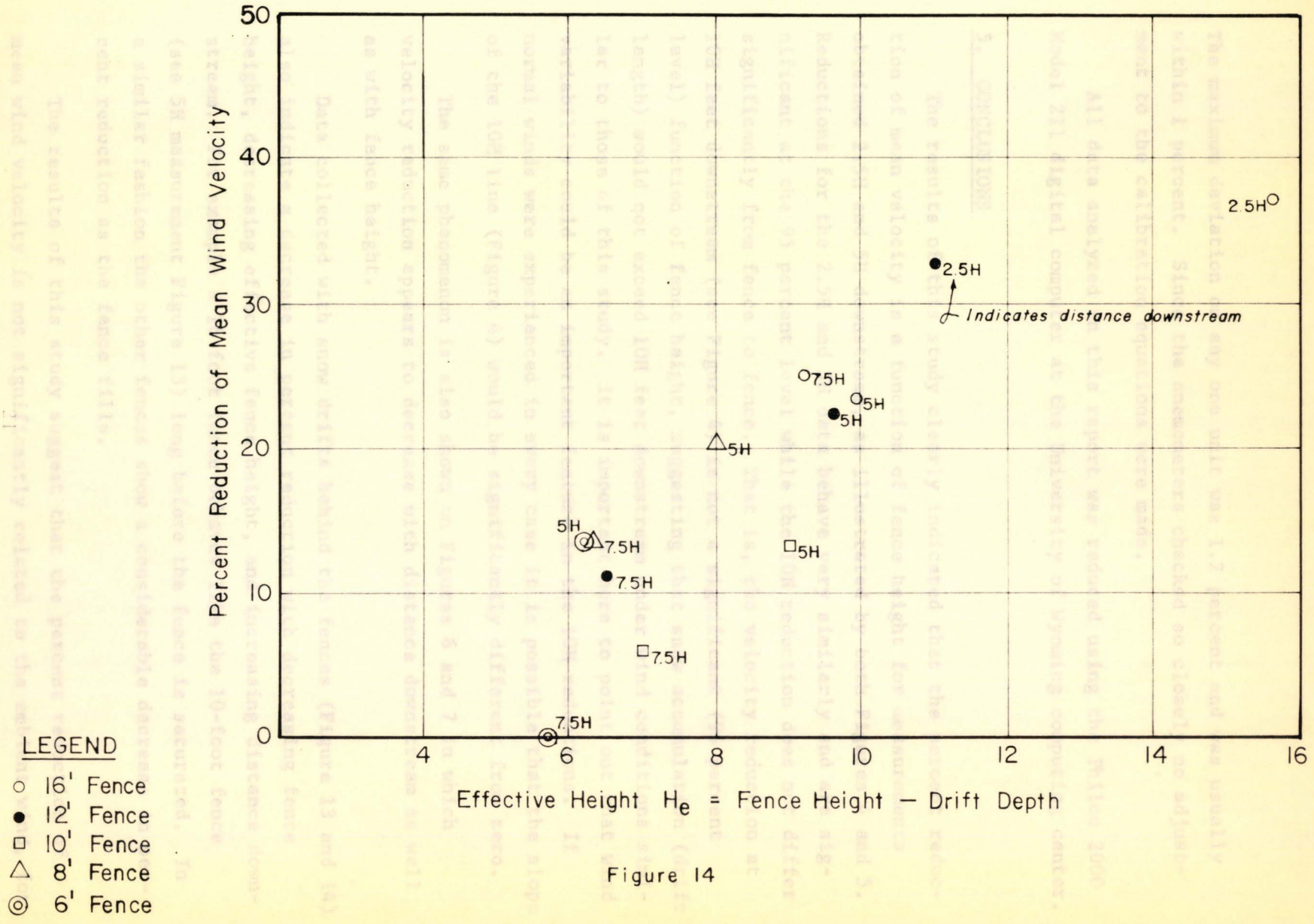

50
40
30
20
10
0
Percent Reduction of Mean Wind Velocity
4
6
8
10
12
14
16
Effective Height H_e = Fence Height − Drift Depth
2.5H
2.5H
Indicates distance downstream
7.5H
5H
5H
5H
5H
7.5H
7.5H
5H
7.5H
7.5H
LEGEND
16' Fence
12' Fence
10' Fence
8' Fence
6' Fence

Figure 14

the ranges considered, at the 95 percent level for the 16, 12, 10 and 8-foot fences. The relationship for the 6-foot fence was significant at the 95 percent level.

Temperature measurements taken during the study indicate that stability would not be a significant factor concerning the velocity reduction parameter. If stratification for Richardson's number were necessary, simultaneous readings and thermisters with perhaps $\pm$0.1°C. resolution would be required.

It is important to remember that all of the results from this study are based on fences with a two foot gap under the fence and that the assumption $R_{\bar{v}} = f(H)\Big|_{1'}^{H'}$, and $R_{\bar{v}} \neq \phi(H)\Big|_{H'}^{\infty}$, (see Section 4) is valid.

Peculiarities on some velocity profiles were noted such as those shown on velocity measurement for fence location one and two (see Figures 9 and 25 Appendix). These peculiarities might possibly be local terrain interactions.

6. RECOMMENDATIONS FOR FUTURE RESEARCH

1. An important assumption used in this research was $R_{\bar{v}} = f(H)\Big|_{1'}^{H'}$ and $R_{\bar{v}} \neq \phi(H)\Big|_{H'}^{\infty}$. It would certainly be in order to check the validity of this assumption which might be done by determining the wind velocity at $H + \frac{H}{2}$.

2. Repeat same basic measurement procedure for fences with a reduced gap or possibly no gap at all.

3. Investigate local wind terrain interaction that might influence fence placement.

4. Investigate collection efficiency as influenced by snow accretion. Attempt to define in a quantitative way the effectiveness of fences as a function of drift cross-section and ambient wind.

5. Define more clearly necessary conditions of saturation for fences of various heights.

APPENDIX

TABLE II

Velocity data obtained under no snow conditions are tabulated on pages 2 through 31 Appendix.

Fence No. 1; Height 16; D_d 40; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	9.2	30.1	20.5
12.0	9.0	29.7	20.2
8.0	8.5	27.7	18.9
4.0	7.4	24.3	16.6
2.0	6.0	19.8	13.5
1.0	2.9	9.6	6.5

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	5.5	17.9	12.2
12.0	4.5	14.8	10.1
8.0	4.2	13.7	9.3
4.0	4.6	15.0	10.2
2.1	4.7	15.5	10.6
1.0	4.3	14.3	9.7

Fence No. 1; Height 16; D_d 80; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.1	23.2	15.8
12.0	7.2	23.6	16.1
8.0	6.7	21.8	14.9
4.0	6.0	19.8	13.5
2.0	4.9	16.1	11.0
1.0	2.5	8.1	5.5

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	5.8	18.9	12.9
12.0	5.3	17.5	11.9
8.0	5.1	16.6	11.3
4.0	4.7	15.4	10.5
2.1	4.3	14.0	9.5
1.0	3.8	12.6	8.6

Fence No. 1; Height 16; D_d 160; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.3	23.9	16.3
12.0	7.3	23.9	16.3
8.0	6.8	22.4	15.2
4.0	6.2	20.3	13.9
2.0	5.0	16.4	11.2
1.0	2.5	8.2	5.6

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.8	25.6	17.5
12.0	7.6	25.1	17.1
8.0	7.3	24.1	16.4
4.0	6.7	21.8	14.9
2.1	6.1	19.9	13.6
1.0	5.5	18.1	12.4

Fence No. 3; Height 16; D_d 40; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	10.0	32.9	22.4
12.0	9.8	32.3	22.0
8.0	9.1	30.0	20.4
4.0	8.1	26.4	18.0
2.0	6.4	21.0	14.3
1.0	5.8	19.0	13.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.8	22.2	15.1
12.0	5.5	18.1	12.3
8.0	4.7	15.4	10.5
4.0	4.8	15.8	10.8
2.1	4.7	15.4	10.5
1.0	4.1	13.6	9.3

Fence No. 3; Height 16; D_d 80; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	10.1	33.2	22.6
12.0	10.1	33.3	22.7
8.0	9.4	31.0	21.1
4.0	8.3	27.1	18.5
2.0	6.7	21.9	14.9
1.0	6.2	20.2	13.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.1	23.4	16.0
12.0	6.2	20.3	13.8
8.0	5.4	17.6	12.0
4.0	4.7	15.3	10.4
2.1	4.1	13.5	9.2
1.0	3.6	11.7	8.0

Fence No. 3; Height 16; D_d 160; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	9.7	31.7	21.6
12.0	9.5	31.0	21.1
8.0	8.8	28.9	19.7
4.0	7.7	25.4	17.3
2.0	6.1	19.9	13.6
1.0	5.5	18.1	12.3

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	8.4	27.6	18.8
12.0	8.1	26.6	18.1
8.0	7.7	25.3	17.2
4.0	7.0	23.0	15.7
2.1	6.2	20.4	13.9
1.0	5.3	17.5	11.9

Fence No. 9; Height 16; D_d 40; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	11.1	36.4	24.8
12.0	11.2	36.7	25.0
8.0	10.5	34.5	23.5
4.0	9.3	30.7	20.9
2.0	8.1	26.7	18.2
1.0	6.5	21.3	14.5

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.1	20.1	13.7
12.0	4.3	14.2	9.7
8.0	4.0	13.2	9.0
4.0	5.3	17.5	11.9
2.1	5.9	19.3	13.2
1.0	5.6	18.3	12.5

Fence No. 9; Height 16; D_d 80; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.6	41.4	28.2
12.0	12.6	41.5	28.3
8.0	12.0	39.3	26.8
4.0	10.8	35.3	24.1
2.0	9.4	30.9	21.1
1.0	7.5	24.5	16.7

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	8.4	27.7	18.9
12.0	6.6	21.5	14.7
8.0	5.6	18.3	12.5
4.0	5.7	18.6	12.7
2.1	5.4	17.7	12.1
1.0	4.8	15.8	10.8

Fence No. 9; Height 16; D_d 160; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	13.7	44.9	30.6
12.0	13.8	45.3	30.9
8.0	13.1	42.9	29.2
4.0	11.7	38.5	26.2
2.0	10.4	34.0	23.2
1.0	8.3	27.2	18.6

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	9.2	30.3	20.6
12.0	8.0	26.2	17.9
8.0	6,9	22.5	15.3
4.0	5.7	18.8	12.8
2.1	4.9	16.1	11.0
1.0	4.5	14.8	10.1

Fence No. 10; Height 16; D_d 40; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	11.6	38.1	26.0
12.0	11.7	38.5	26.3
8.0	11.0	36.0	24.6
4.0	9.9	32.4	22.1
2.0	9.0	29.5	20.1
1.0	7.5	24.4	16.7

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	8.0	26.2	17.8
12.0	5.4	17.8	12.1
8.0	4.7	15.3	10.4
4.0	5.6	18.3	12.5
2.1	5.9	19.4	13.2
1.0	5.5	17.9	12.2

Fence No. 10; Height 16; D_d 80; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	11.4	37.2	25.4
12.0	11.4	37.3	25.4
8.0	10.6	34.6	23.6
4.0	9.4	31.0	21.1
2.0	8.3	27.3	18.6
1.0	7.1	23.4	16.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	8.7	28.4	19.4
12.0	6.8	22.4	15.2
8.0	5.5	17.9	12.2
4.0	5.0	16.4	11.2
2.1	4.5	14.8	10.1
1.0	4.1	13.4	9.1

Fence No. 10; Height 16; D_d 160; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	10.1	33.0	22.5
12.0	10.1	33.1	22.6
8.0	9.5	31.0	21.2
4.0	8.5	27.9	19.0
2.0	7.5	24.8	16.9
1.0	6.5	21.3	14.5

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	8.0	26.2	17.8
12.0	7.1	23.2	15.8
8.0	6.3	20.5	14.0
4.0	5.2	17.1	11.7
2.1	4.5	14.9	10.1
1.0	4.1	13.4	9.1

Fence No. 4; Height 12; D_d 30; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.0	19.8	13.5
12.0	6.0	19.7	13.4
8.0	5.7	18.7	12.7
4.0	5.3	17.2	11.7
2.0	4.1	13.5	9.2
1.0	4.1	13.4	9.1

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	4.7	15.5	10.6
12.0	3.4	11.3	7.7
8.0	3.2	10.5	7.2
4.0	3.3	11.0	7.5
2.1	3.6	11.9	8.1
1.0	3.6	11.9	8.1

Fence No. 4; Height 12; D_d 60; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	9.2	30.1	20.5
12.0	9.3	30.4	20.8
8.0	8.7	28.7	19.6
4.0	8.0	26.4	18.0
2.0	6.8	22.3	15.2
1.0	6.2	20.4	13.9

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.3	24.1	16.4
12.0	6.0	19.7	13.5
8.0	5.1	16.7	11.4
4.0	4.8	15.8	10.8
2.1	4.6	15.2	10.3
1.0	4.0	13.1	8.9

Fence No. 4; Height 12; D_d 120; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	5.3	17.3	11.8
12.0	5.2	17.2	11.7
8.0	4.9	16.2	11.0
4.0	4.6	14.9	10.2
2.0	3.6	11.8	8.0
1.0	3.5	11.5	7.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	5.0	16.3	11.1
12.0	4.7	15.4	10.5
8.0	4.3	14.2	9.7
4.0	3.8	12.6	8.6
2.1	3.6	11.7	7.9
1.0	3.0	9.8	6.7

Fence No. 7; Height 12; D_d 30; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	15.7	51.6	35.2
12.0	15.8	51.9	35.4
8.0	14.6	47.8	32.6
4.0	12.8	41.9	28.6
2.0	11.6	38.0	25.9
1.0	8.8	28.9	19.7

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	10.4	34.1	23.2
9.0	7.0	22.9	15.6
6.0	6.3	20.8	14.2
3.2	8.5	27.9	19.0
2.1	9.4	30.7	20.9
1.0	8.3	27.4	18.7

Fence No. 7; Height 12; D_d 60; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	14.4	47.3	32.2
12.0	14.5	47.5	32.4
8.0	13.5	44.2	30.1
4.0	11.9	39.0	26.6
2.0	10.7	35.2	24.0
1.0	8.1	26.5	18.1

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	10.7	35.3	24.0
9.0	7.8	25.5	17.4
6.0	7.3	24.0	16.4
3.2	7.2	23.6	16.1
2.1	6.8	22.5	15.3
1.0	7.6	25.1	17.1

Fence No. 7; Height 12; D_d 120; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	14.9	48.9	33.3
12.0	15.0	49.1	33.5
8.0	13.9	45.5	31.0
4.0	12.2	40.0	27.3
2.0	10.9	35.7	24.3
1.0	8.0	26.3	17.9

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	10.8	35.4	24.1
9.0	9.4	31.0	21.1
6.0	8.2	26.7	18.2
3.2	6.9	22.6	15.4
2.1	6.2	20.3	13.8
1.0	5.4	17.6	12.0

Fence No. 8; Height 12; D_d 30; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	11.0	35.9	24.5
12.0	11.0	36.1	24.6
8.0	10.2	33.5	22.8
4.0	9.0	29.4	20.1
2.0	8.2	26.9	18.3
1.0	6.9	22.5	15.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	7.2	23.6	16.1
9.0	5.2	17.2	11.7
6.0	5.0	16.5	11.2
3.2	6.0	19.7	13.4
2.1	6.4	21.1	14.4
1.0	6.4	21.0	14.3

Fence No. 8; Height 12; D_d 60; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	10.5	34.4	23.5
12.0	10.6	34.8	23.7
8.0	9.9	32.4	22.1
4.0	8.7	28.4	19.4
2.0	8.0	26.2	17.8
1.0	6.7	22.0	15.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	8.1	26.6	18.1
9.0	6.7	21.9	14.9
6.0	5.6	18.4	12.5
3.2	5.4	17.7	12.0
2.1	5.2	16.9	11.5
1.0	4.7	15.5	10.6

Fence No. 8; Height 12; D_d 120; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.3	40.3	27.5
12.0	12.4	40.7	27.7
8.0	11.5	37.6	25.6
4.0	10.1	33.1	22.6
2.0	9.2	30.2	20.6
1.0	7.7	25.2	17.2

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	9.3	30.5	20.8
9.0	8.3	27.1	18.5
6.0	7.1	23.4	16.0
3.2	6.0	19.7	13.4
2.1	5.4	17.6	12.0
1.0	4.8	15.6	10.6

Fence No. 10; Height 12; D_d 30; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	11.4	37.4	25.5
12.0	11.5	37.6	25.6
8.0	10.8	35.5	24.2
4.0	9.8	32.2	21.9
2.0	8.7	28.6	19.5
1.0	7.5	24.4	16.7

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.8	42.1	28.7
12.0	9.2	30.1	20.5
8.0	5.9	19.3	13.1
4.0	6.3	20.8	14.2
2.1	7.4	24.3	16.5
1.0	7.3	23.9	16.3

Fence No. 10; Height 12; D_d 60; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	11.7	38.5	26.3
12.0	11.8	38.8	26.4
8.0	11.1	36.4	24.8
4.0	10.0	32.7	22.3
2.0	8.9	29.2	19.9
1.0	7.4	24.3	16.6

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	11.2	36.7	25.0
12.0	8.8	28.8	19.6
8.0	6.5	21.4	14.6
4.0	5.9	19.5	13.3
2.1	5.7	18.7	12.8
1.0	5.1	16.6	11.3

Fence No. 10; Height 12; D_d 120; D_u 120

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	11.4	37.4	25.5
12.0	11.4	37.5	25.6
8.0	10.8	35.4	24.1
4.0	9.6	31.7	21.6
2.0	8.5	28.0	19.1
1.0	7.3	24.0	16.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	9.9	32.6	22.2
12.0	8.8	28.8	19.7
8.0	7.5	24.8	16.9
4.0	6.5	21.2	14.4
2.1	5.6	18.4	12.5
1.0	5.1	16.9	11.5

Fence No. 2; Height 10; D_d 25; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	8.9	29.2	19.9
12.0	9.1	29.7	20.3
8.0	8.3	27.3	18.6
4.0	7.6	25.0	17.1
2.0	5.9	19.2	13.1
1.0	5.5	18.1	12.3

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.1	6.9	22.6	15.4
7.5	4.9	16.0	10.9
5.0	4.5	14.7	10.0
3.2	5.1	16.6	11.3
2.1	5.6	18.3	12.5
1.0	6.1	20.1	13.7

Fence No. 2; Height 10; D_d 50; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.9	25.8	17.6
12.0	8.0	26.2	17.9
8.0	7.3	23.9	16.3
4.0	6.7	21.9	14.9
2.0	5.0	16.5	11.3
1.0	4.9	16.2	11.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.1	6.2	20.5	14.0
7.5	5.3	17.4	11.9
5.0	4.6	15.1	10.3
3.2	4.6	15.0	10.2
2.1	4.5	14.8	10.1
1.0	4.1	13.3	9.1

Fence No. 2; Height 10; D_d 100; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.8	22.3	15.2
12.0	6.9	22.6	15.4
8.0	6.2	20,5	14.0
4.0	5.8	19.0	13.0
2.0	4.2	13.8	9.4
1.0	4.2	13.7	9.3

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.1	5.6	18.4	12.5
7.5	5.2	16.9	11.5
5.0	4.7	15.4	10.5
3.2	4.3	14.2	9.7
2.1	4.0	13.1	8.9
1.0	3.5	11.5	7.9

Fence No. 3; Height 10; D_d 25; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.5	24.6	16.8
12.0	7.6	25.0	17.0
8.0	6.8	22.2	15.2
4.0	6.3	20.5	14.0
2.0	5.1	16.8	11.4
1.0	4.9	15.9	10.9

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	5.4	17.8	12.1
7.5	4.4	14.3	9.7
5.0	4.3	14.1	9.6
3.2	4.4	14.6	9.9
2.1	4.7	15.4	10.5
1.0	4.5	14.7	10.0

Fence No. 3; Height 10; D_d 50; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.5	24.6	16.8
12.0	7.6	25.0	17.0
8.0	6.9	22.6	15.4
4.0	6.3	20.8	14.2
2.0	5.2	17.1	11.7
1.0	4.9	16.1	11.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	6.6	21.6	14.7
7.5	5.9	19.3	13.1
5.0	5.3	17.5	11.9
3.2	5.2	16.9	11.5
2.1	4.9	16.1	11.0
1.0	4.4	14.5	9.9

Fence No. 3; Height 10; D_d 100; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.1	23.2	15.8
12.0	7.2	23.5	16.0
8.0	6.4	21.0	14.3
4.0	5.9	19.4	13.2
2.0	4.8	15.7	10.7
1.0	4.5	14.9	10.1

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	7.1	23.5	16.0
7.5	6.9	22.6	15.4
5.0	6.5	21.4	14.6
3.2	6.2	20.4	13.9
2.1	5.9	19.3	13.1
1.0	5.1	16.7	11.4

Fence No. 5; Height 10; D_d 25; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	13.3	43.5	29.6
12.0	13.3	43.7	29.8
8.0	12.4	40.8	27.8
4.0	11.0	36.1	24.6
2.0	9.7	31.8	21.7
1.0	8.7	28.4	19.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.1	39.6	27.0
12.0	6.7	21.9	15.0
8.0	5.5	18.1	12.4
4.0	7.2	23.6	16.1
2.1	8.7	28.5	19.4
1.0	9.3	30.4	20.7

Fence No. 5; Height 10; D_d 50; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.3	40.2	27.4
12.0	12.4	40.8	27.8
8.0	11.6	38.1	26.0
4.0	10.3	33.7	23.0
2.0	9.1	29.9	20.4
1.0	8.1	26.7	18.2

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	11.0	35.9	24.5
12.0	8.6	28.2	19.2
8.0	6.3	20.7	14.1
4.0	6.4	21.0	14.3
2.1	6.6	21.6	14.7
1.0	6.5	21.3	14.5

Fence No. 5; Height 10; D_d 100; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.1	39.6	27.0
12.0	12.2	40.1	27.3
8.0	11.5	37.7	25.7
4.0	10.2	33.6	22.9
2.0	9.0	29.6	20.2
1.0	8.1	26.7	18.2

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	10.3	33.9	23.1
12.0	9.2	30.1	20.5
8.0	7.9	25.8	17.6
4.0	6.8	22.4	15.3
2.1	6.2	20.3	13.9
1.0	5.5	18.0	12.3

Fence No. 7; Height 10; D_d 25; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	14.1	46.4	31.6
12.0	14.1	46.2	31.5
8.0	13.1	42.9	29.2
4.0	11.5	37.9	25.8
2.0	10.4	34.0	23.2
1.0	8.0	26.2	17.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	12.2	40.1	27.3
9.0	7.7	25.3	17.3
6.0	5.7	18.6	12.6
3.2	7.7	25.2	17.2
2.1	8.7	28.5	19.4
1.0	8.8	28.7	19.6

Fence No. 7; Height 10; D_d 50; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	14.7	48.2	32.9
12.0	14.8	48.5	33.0
8.0	13.7	44.9	30.6
4.0	12.0	39.5	26.9
2.0	10.9	35.8	24.4
1.0	8.4	27.5	18.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	13.5	44.2	30.1
9.0	10.8	35.3	24.1
6.0	8.1	26.7	18.2
3.2	7.9	26.0	17.7
2.1	7.8	25.7	17.5
1.0	7.4	24.4	16.6

Fence No. 7; Height 10; D_d 100; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	16.2	53.0	36.2
12.0	16.1	52.9	36.1
8.0	14.8	48.6	33.1
4.0	13.1	43.0	29.3
2.0	11.9	39.2	26.7
1.0	9.2	30.3	20.6

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	12.8	42.0	28.7
9.0	11.3	37.2	25.4
6.0	9.7	31.9	21.8
3.2	8.1	26.5	18.0
2.1	7.1	23.4	15.9
1.0	6.3	20.7	14.1

Fence No. 2; Height 8; D_d 20; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	5.6	18.5	12.6
12.0	5.5	18.1	12.4
8.0	5.1	16.8	11.4
4.0	4.9	16.1	11.0
2.0	3.5	11.5	7.9
1.0	3.1	10.1	6.9

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	4.8	15.6	10.7
6.0	4.2	13.9	9.4
4.3	3.8	12.6	8.6
3.2	3.8	12.3	8.4
2.1	3.7	12.0	8.2
1.0	3.4	11.0	7.5

Fence No. 2; Height 8; D_d 40; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	5.8	19.1	13.0
12.0	5.8	18.9	12.9
8.0	5.4	17.6	12.0
4.0	5.2	16.9	11.6
2.0	3.6	11.9	8.1
1.0	3.3	10.8	7.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	5.5	18.1	12.3
6.0	5.2	17.2	11.7
4.3	4.8	15.8	10.8
3.2	4.6	15.0	10.2
2.1	4.1	13.5	9.2
1.0	3.4	11.0	7.5

Fence No. 2; Height 8; D_d 80; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	4.9	16.0	10.9
12.0	4.7	15.6	10.6
8.0	4.4	14.5	9.9
4.0	4.3	14.0	9.6
2.0	3.2	10.4	7.1
1.0	2.9	9.7	6.6

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	5.0	16.3	11.1
6.0	4.8	15.6	10.7
4.3	4.5	14.9	10.1
3.2	4.3	14.3	9.7
2.1	4.0	13.0	8.9
1.0	3.2	10.5	7.2

Fence No. 4; Height 8; D_d 20; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.1	23.2	15.8
12.0	7.1	23.2	15.8
8.0	6.7	22.0	15.0
4.0	6.2	20.3	13.8
2.0	4.8	15.8	10.8
1.0	4.7	15.5	10.6

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.3	24.0	16.4
12.0	6.0	19.6	13.4
8.0	3.9	12.9	8.8
4.0	3.9	12.8	8.7
2.1	4.4	14.5	9.9
1.0	4.7	15.3	10.4

Fence No. 4; Height 8; D_d 40; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.9	26.0	17.7
12.0	8.0	26.2	17.8
8.0	7.5	24.7	16.9
4.0	6.9	22.7	15.5
2.0	5.6	18.4	12.6
1.0	5.3	17.5	11.9

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.9	26.1	17.8
12.0	6.8	22.2	15.1
8.0	5.3	17.4	11.9
4.0	4.7	15.4	10.5
2.1	4.6	14.9	10.2
1.0	4.2	13.7	9.3

Fence No. 4; Height 8; D_d 80; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	9.3	30.6	20.9
12.0	9.5	31.1	21.2
8.0	9.0	29.5	20.1
4.0	8.3	27.1	18.5
2.0	7.0	22.8	15.6
1.0	6.5	21.2	14.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	9.2	30.2	20.6
12.0	8.2	27.0	18.4
8.0	7.0	23.0	15.7
4.0	5.9	19.4	13.2
2.1	5.4	17.7	12.1
1.0	4.8	15.7	10.7

Fence No. 6; Height 8; D_d 20; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	13.8	45.3	30.9
12.0	13.9	45.5	31.0
8.0	12.9	42.2	28.8
4.0	11.4	37.4	25.5
2.0	10.4	34.0	23.2
1.0	8.8	29.0	19.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	14.5	47.4	32.3
9.0	11.4	37.4	25.5
6.0	6.1	20.0	13.7
3.2	7.2	23.7	16.1
2.1	8.7	28.6	19.5
1.0	9.6	31.5	21.5

Fence No. 6; Height 8; D_d 40; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.1	39.8	27.2
12.0	12.2	40.0	27.3
8.0	11.3	36.9	25.2
4.0	9.9	32.6	22.3
2.0	9.0	29.5	20.1
1.0	7.7	25.2	17.2

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	12.2	39.9	27.2
9.0	10.0	32.7	22.3
6.0	7.2	23.6	16.1
3.2	6.5	21.5	14.6
2.1	6.5	21.2	14.5
1.0	6.4	20.9	14.2

Fence No. 6; Height 8; D_d 80; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	15.0	49.4	33.7
12.0	15.1	49.6	33.8
8.0	14.1	46.1	31.4
4.0	12.5	41.0	27.9
2.0	11.4	37.5	25.6
1.0	9.7	31.9	21.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	12.9	42.3	28.8
9.0	11.5	37.8	25.8
6.0	9.8	32.1	21.9
3.2	8.1	26.5	18.1
2.1	7.2	23.5	16.0
1.0	6.1	20.1	13.7

Fence No. 9; Height 8; D_d 20; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.7	41.6	28.4
12.0	12.7	41.6	28.4
8.0	11.9	39.2	26.7
4.0	10.6	34.9	23.8
2.0	9.3	30.5	20.8
1.0	7.7	25.1	17.1

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	12.1	39.6	27.0
9.0	9.1	29.9	20.4
6.0	5.1	16.7	11.4
3.2	5.8	19.1	13.0
2.1	7.2	23.5	16.0
1.0	8.1	26.6	18.2

Fence No. 9; Height 8; D_d 40; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	11.4	37.2	25.4
12.0	11.4	37.4	25.5
8.0	10.7	35.1	23.9
4.0	9.5	31.2	21.3
2.0	8.3	27.2	18.5
1.0	6.7	22.0	15.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	10.5	34.5	23.5
9.0	8.6	28.3	19.3
6.0	6.6	21.5	14.7
3.2	6.0	19.7	13.4
2.1	6.0	19.6	13.4
1.0	5.8	18.9	12.9

Fence No. 9; Height 8; D_d 80; D_u 80

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	13.1	42.9	29.2
12.0	13.1	43.0	29.3
8.0	12.3	40.4	27.5
4.0	11.0	36.1	24.6
2.0	9.6	31.6	21.6
1.0	7.8	25.5	17.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	11.1	36.3	24.7
9.0	9.8	32.2	22.0
6.0	8.2	26.9	18.3
3.2	6.8	22.3	15.2
2.1	6.1	20.0	13.7
1.0	5.3	17.5	12.0

Fence No. 1; Height 6; D_d 15; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	8.9	29.2	19.9
12.0	9.0	29.4	20.0
8.0	8.6	28.1	19.1
4.0	8.2	27.0	18.4
2.0	6.4	21.0	14.3
1.0	5.2	16.9	11.5

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
6.5	7.0	23.0	15.7
5.5	5.6	18.5	12.6
4.3	4.6	14.9	10.2
3.2	4.5	14.8	10.1
2.1	5.4	17.7	12.0
1.0	6.3	20.5	14.0

Fence No. 1; Height 6; D_d 30; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.3	23.8	16.3
12.0	7.3	24.0	16.4
8.0	7.0	22.9	15.6
4.0	6.9	22.7	15.5
2.0	5.3	17.3	11.8
1.0	3.8	12.4	8.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
6.5	6.5	21.4	14.6
5.5	6.1	20.2	13.8
4.3	5.7	18.6	12.7
3.2	5.2	17.2	11.7
2.1	4.8	15.9	10.8
1.0	4.4	14.6	9.9

Fence No. 1; Height 6; D_d 60; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	9.0	29.7	20.2
12.0	9.1	29.8	20.3
8.0	8.7	28.5	19.5
4.0	8.3	27.1	18.5
2.0	6.4	21.0	14.3
1.0	5.1	16.7	11.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
6.5	9.2	30.2	20.6
5.5	9.2	30.2	20.6
4.3	8.9	29.2	19.9
3.2	8.5	28.0	19.1
2.1	8.0	26.3	17.9
1.0	7.0	23.1	15.8

Fence No. 5; Height 6; D_d 15; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.4	40.7	27.8
12.0	12.6	41.4	28.2
8.0	11.8	38.8	26.5
4.0	10.6	34.6	23.6
2.0	9.2	30.1	20.5
1.0	8.4	27.4	18.7

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	13.1	42.9	29.3
12.0	11.9	39.0	26.6
8.0	8.3	27.2	18.5
4.0	6.8	22.5	15.3
2.1	7.3	23.8	16.2
1.0	7.1	23.2	15.8

Fence No. 5; Height 6; D_d 30; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.8	42.1	28.7
12.0	13.0	42.6	29.0
8.0	12.1	39.7	27.0
4.0	10.9	35.8	24.4
2.0	9.6	31.3	21.4
1.0	8.7	28.7	19.6

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	13.0	42.5	29.0
12.0	11.8	38.7	26.4
8.0	9.5	31.1	21.2
4.0	7.7	25.2	17.2
2.1	7.1	23.2	15.8
1.0	6.5	21.4	14.6

Fence No. 5; Height 6; D_d 60; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	13.2	43.3	29.6
12.0	13.3	43.6	29.7
8.0	12.3	40.4	27.6
4.0	11.1	36.3	24.7
2.0	9.7	31.7	21.6
1.0	8.9	29.3	20.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.8	42.1	28.7
12.0	11.7	38.5	26.2
8.0	9.9	32.6	22.2
4.0	8.2	26.7	18.2
2.1	7.4	24.2	16.5
1.0	6.6	21.6	14.7

Fence No. 6; Height 6; D_d 15; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.4	40.7	27.8
12.0	12.5	40.9	27.9
8.0	11.6	38.0	25.9
4.0	10.2	33.5	22.8
2.0	9.2	30.3	20.7
1.0	7.9	25.9	17.7

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	13.2	43.3	29.5
9.0	12.9	42.2	28.8
6.0	9.0	29.4	20.1
3.2	5.5	17.9	12.2
2.1	7.2	23.6	16.1
1.0	8.5	27.8	18.9

Fence No. 6; Height 6; D_d 30; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	12.8	42.0	28.6
12.0	12.8	42.0	28.6
8.0	11.9	38.9	26.5
4.0	10.5	34.5	23.5
2.0	9.5	31.2	21.3
1.0	8.1	26.6	18.1

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	13.5	44.4	30.3
9.0	12.4	40.6	27.7
6.0	9.5	31.0	21.1
3.2	7.2	23.6	16.1
2.1	6.9	22.7	15.5
1.0	6.8	22.2	15.2

Fence No. 6; Height 6; D_d 60; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	13.7	45.0	30.7
12.0	13.7	45.1	30.7
8.0	12.9	42.2	28.7
4.0	11.3	37.0	25.3
2.0	10.2	33.5	22.8
1.0	8.7	28.6	19.5

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	14.2	46.7	31.8
9.0	13.1	43.1	29.4
6.0	11.2	36.7	25.0
3.2	9.1	29.7	20.3
2.1	8.2	26.8	18.2
1.0	7.5	24.5	16.7

Fence No. 8; Height 6; D_d 15; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	9.2	30.1	20.5
12.0	9.3	30.5	20.8
8.0	8.6	28.1	19.2
4.0	7.6	25.0	17.0
2.0	6.7	21.9	14.9
1.0	6.0	19.5	13.3

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	10.3	33.9	23.1
9.0	9.6	31.6	21.5
6.0	7.3	24.1	16.4
3.2	5.8	18.9	12.9
2.1	5.2	17.0	11.6
1.0	4.5	14.8	10.1

Fence No. 8; Height 6; D_d 30; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	9.9	32.5	22.2
12.0	10.0	32.8	22.4
8.0	9.3	30.4	20.8
4.0	8.2	26.8	18.3
2.0	7.4	24.3	16.6
1.0	6.3	20.6	14.1

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	10.2	33.6	22.9
9.0	9.4	30.9	21.1
6.0	7.7	25.4	17.3
3.2	5.9	19.4	13.2
2.1	5.1	16.7	11.4
1.0	4.4	14.3	9.8

Fence No. 8; Height 6; D_d 60; D_u 60

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.6	24.8	16.9
12.0	7.7	25.3	17.3
8.0	7.1	23.4	16.0
4.0	6.3	20.6	14.1
2.0	5.5	18.2	12.4
1.0	4.7	15.5	10.6

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	7.7	25.4	17.3
9.0	7.3	23.8	16.3
6.0	6.5	21.2	14.5
3.2	5.4	17.7	12.0
2.1	4.7	15.6	10.6
1.0	4.2	13.6	9.3

TABLE III

Velocity data obtained with snow accumulated behind certain snow fences are tabulated on pages 33 through 47 Appendix.

Fence No. 10; Height 16; D_d 38; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.9	22.5	15.3
12.0	6.5	21.4	14.6
8.0	6.1	20.0	13.6
4.0	5.5	18.1	12.3
2.0	5.0	16.3	11.1
1.0	2.1	7.0	4.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	4.2	13.9	9.5
12.0	3.5	11.6	7.9
8.0	3.5	11.6	7.9
6.0	4.0	13.0	8.9
4.0	4.3	13.9	9.5
2.0	4.1	13.5	9.2

Fence No. 10; Height 16; D_d 80; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.7	21.9	14.9
12.0	6.4	21.0	14.3
8.0	6.1	19.9	13.6
4.0	5.5	18.1	12.3
2.0	4.9	16.1	11.0
1.0	2.1	7.0	4.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	5.5	18.0	12.3
12.0	5.1	16.6	11.3
8.0	4.5	14.9	10.2
6.0	4.4	14.3	9.8
4.0	4.0	13.0	8.9
2.0	3.7	12.2	8.3

Fence No. 10; Height 16; D_d 120; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.3	24.0	16.4
12.0	7.0	23.0	15.7
8.0	6.6	21.7	14.8
4.0	6.1	20.1	13.7
2.0	5.4	17.6	12.0
1.0	2.2	7.3	5.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.2	20.4	13.9
12.0	5.7	18.7	12.8
8.0	5.0	16.3	11.1
6.0	4.7	15.4	10.5
4.0	4.3	14.2	9.7
2.0	3.9	12.7	8.7

Fence No. 10; Height 16; D_d 160; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.4	24.4	16.7
12.0	7.2	23.5	16.0
8.0	6.8	22.3	15.2
4.0	6.3	20.6	14.1
2.0	5.5	17.9	12.2
1.0	2.3	7.5	5.1

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	5.4	17.6	12.0
12.0	4.9	16.2	11.1
8.0	4.3	14.1	9.6
6.0	3.9	12.9	8.8
4.0	3.3	10.7	7.3
2.0	2.4	7.8	5.3

Fence No. 10; Height 16; D_d 200; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.2	23.6	16.1
12.0	6.9	22.6	15.4
8.0	6.5	21.3	14.5
4.0	5.9	19.5	13.3
2.0	5.1	16.9	11.5
1.0	2.1	6.9	4.7

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	5.9	19.3	13.2
12.0	5.7	18.6	12.7
8.0	5.3	17.3	11.8
6.0	5.1	16.7	11.4
4.0	4.6	15.2	10.4
2.0	4.0	13.2	9.0

Fence No. 10; Height 16; D_d 240; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	5.8	18.9	12.9
12.0	5.5	18.1	12.4
8.0	5.2	17.1	11.7
4.0	4.9	16.0	10.9
2.0	4.3	14.2	9.7
1.0	1.8	5.9	4.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.1	20.1	13.7
12.0	6.1	20.1	13.7
8.0	5.9	19.5	13.3
6.0	5.8	18.9	12.9
4.0	5.2	16.9	11.5
2.0	4.1	13.4	9.1

Fence No. 10; Height 12; D_d 44; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.4	21.0	14.3
12.0	6.2	20.2	13.8
8.0	5.9	19.3	13.1
4.0	5.3	17.4	11.9
2.0	4.6	15.2	10.4
1.0	2.0	6.6	4.5

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	4.5	14.7	10.0
9.0	3.6	11.9	8.1
6.0	3.2	10.6	7.2
3.0	3.6	11.5	8.0
2.0	3.6	11.7	7.9
1.0	3.4	11.2	7.7

Fence No. 10; Height 12; D_d 60; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.4	24.4	16.6
12.0	7.1	23.4	16.0
8.0	6.7	21.9	14.9
4.0	6.0	19.8	13.5
2.0	5.2	17.0	11.6
1.0	2.3	7.5	5.1

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	6.4	21.1	14.4
9.0	5.4	17.6	12.0
6.0	4.5	14.7	10.0
3.0	4.4	14.3	9.8
2.0	4.2	13.9	9.5
1.0	4.2	13.7	9.3

Fence No. 10; Height 12; D_d 90; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.8	22.1	15.1
12.0	6.5	21.2	14.5
8.0	6.1	20.0	13.6
4.0	5.6	18.4	12.5
2.0	4.9	16.1	11.0
1.0	2.1	7.0	4.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	6.8	22.4	15.3
9.0	6.3	20.8	14.2
6.0	5.5	18.1	12.3
3.0	5.0	16.4	11.2
2.0	4.7	15.3	10.4
1.0	4.5	14.7	10.0

Fence No. 10; Height 12; D_d 120; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	6.7	22.0	15.0
12.0	6.5	21.4	14.6
8.0	6.1	20.0	13.7
4.0	5.5	18.1	12.3
2.0	4.8	15.8	10.8
1.0	2.1	6.9	4.7

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	6.2	20.3	13.8
9.0	5.9	19.3	13.2
6.0	5.3	17.5	12.0
3.0	5.0	16.3	11.1
2.0	4.6	15.2	10.4
1.0	4.3	14.2	9.7

Fence No. 10; Height 12; D_d 150; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.6	25.1	17.1
12.0	7.4	24.3	16.6
8.0	7.0	23.1	15.7
4.0	6.5	21.2	14.5
2.0	5.6	18.4	12.6
1.0	2.4	8.0	5.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	6.3	20.6	14.0
9.0	5.9	19.4	13.2
6.0	5.3	17.5	11.9
3.0	4.7	15.3	10.5
2.0	4.2	13.7	9.3
1.0	3.3	11.0	7.5

Fence No. 10; Height 12; D_d 180; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
16.0	7.0	23.1	15.7
12.0	6.8	22.2	15.1
8.0	6.3	20.8	14.2
4.0	5.9	19.4	13.2
2.0	5.1	16.7	11.4
1.0	2.2	7.3	5.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
12.0	5.5	18.1	12.3
9.0	5.4	17.7	12.1
6.0	5.0	16.5	11.3
3.0	4.8	15.8	10.8
2.0	4.5	14.7	10.0
1.0	4.1	13.4	9.1

Fence No. 2; Height 10; D_d 50; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	4.0	13.2	9.0
7.5	3.9	12.9	8.8
5.0	3.7	12.2	8.3
3.0	3.6	11.7	8.0
2.0	3.4	11.0	7.5
1.0	1.4	4.7	3.2

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	3.5	11.4	7.8
7.5	3.1	10.2	7.0
5.0	2.7	8.9	6.1
3.0	2.7	8.8	6.0
2.0	2.6	8.5	5.8
1.0	2.4	7.8	5.3

Fence No. 2; Height 10: D_d 75; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	4.2	13.8	9.4
7.5	4.1	13.4	9.2
5.0	3.9	12.7	8.7
3.0	3.6	11.9	8.1
2.0	3.4	11.2	7.7
1.0	1.5	4.8	3.3

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	4.0	13.0	8.9
7.5	3.8	12.4	8.5
5.0	3.4	11.2	7.6
3.0	3.2	10.6	7.2
2.0	3.1	10.0	6.8
1.0	2.8	9.1	6.2

Fence No. 2; Height 10; D_d 100; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	3.7	12.2	8.3
7.5	3.6	11.9	8.1
5.0	3.3	10.9	7.4
3.0	3.2	10.4	7.1
2.0	3.0	9.8	6.7
1.0	1.3	4.4	3.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	3.5	11.4	7.8
7.5	3.2	10.6	7.2
5.0	2.9	9.6	6.6
3.0	2.7	8.8	6.0
2.0	2.5	8.2	5.6
1.0	2.1	7.0	4.8

Fence No. 2; Height 10; D_d 125; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	4.1	13.4	9.2
7.5	4.0	13.0	8.9
5.0	3.7	12.0	8.2
3.0	3.6	11.8	8.0
2.0	3.0	9.7	6.6
1.0	1.4	4.4	3.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	3.6	11.8	8.0
7.5	3.1	10.3	7.0
5.0	2.7	8.9	6.0
3.0	2.4	7.9	5.4
2.0	2.2	7.3	5.0
1.0	1.9	6.2	4.2

Fence No. 2; Height 10; D_d 150; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	4.7	15.3	10.5
7.5	4.5	14.9	10.1
5.0	4.2	13.7	9.3
3.0	5.0	16.3	11.1
2.0	3.4	11.1	7.6
1.0	1.5	4.9	3.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	4.0	13.1	8.9
7.5	3.8	12.4	8.4
5.0	3.3	10.9	7.5
3.0	3.1	10.2	7.0
2.0	2.9	9.5	6.5
1.0	2.6	8.5	5.8

Fence No. 2; Height 10; D_d 205; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	4.5	14.6	10.0
7.5	4.3	14.2	9.7
5.0	4.0	13.3	9.0
3.0	5.0	16.4	11.2
2.0	3.4	11.1	7.6
1.0	1.5	4.8	3.3

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	4.5	14.7	10.0
7.5	4.3	14.2	9.7
5.0	4.1	13.4	9.1
3.0	3.9	12.8	8.7
2.0	3.6	11.8	8.0
1.0	3.2	10.4	7.1

Fence No. 2; Height 8; D_d 40; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	3.9	12.6	8.6
7.5	3.7	12.3	8.4
5.0	3.3	10.9	7.5
3.0	3.1	10.2	6.9
2.0	3.0	9.8	6.7
1.0	1.3	4.1	2.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	3.9	12.7	8.7
8.0	3.3	10.9	7.5
6.0	2.7	8.8	6.0
4.0	2.3	7.6	5.2
2.0	2.4	7.9	5.4
1.0	2.4	7.7	5.3

Fence No. 2; Height 8; D_d 60; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	5.2	17.2	11.7
7.5	5.1	16.8	11.5
5.0	4.8	15.7	10.7
3.0	4.4	14.5	9.9
2.0	3.9	12.8	8.7
1.0	1.8	5.9	4.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	5.0	16.3	11.1
8.0	4.5	14.8	10.1
6.0	3.9	12.9	8.8
4.0	3.5	11.5	7.8
2.0	3.2	10.5	7.1
1.0	3.0	9.9	6.7

Fence No. 2; Height 8; D_d 80; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	5.7	18.7	12.8
7.5	5.6	18.4	12.5
5.0	5.2	17.1	11.7
3.0	4.8	15.7	10.7
2.0	4.2	13.7	9.3
1.0	1.9	6.3	4.3

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	5.6	18.3	12.5
8.0	5.3	17.3	11.8
6.0	4.8	15.6	10.7
4.0	4.3	14.2	9.7
2.0	3.9	12.7	8.7
1.0	3.7	12.0	8.2

Fence No. 2; Height 8; D_d 100; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	6.8	22.2	15.1
7.5	6.7	22.0	15.0
5.0	6.3	20.6	14.1
3.0	5.8	18.9	12.9
2.0	5.0	16.3	11.1
1.0	2.3	7.5	5.1

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	6.6	21.8	14.8
8.0	6.3	20.8	14.2
6.0	5.8	19.0	12.9
4.0	5.2	17.2	11.7
2.0	4.5	14.9	10.2
1.0	4.2	13.7	9.3

Fence No. 2; Height 8; D_d 120; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	6.2	20.4	13.9
7.5	6.1	20.0	13.6
5.0	5.7	18.7	12.8
3.0	5.2	17.2	11.7
2.0	4.6	15.0	10.2
1.0	2.1	6.8	4.7

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	5.9	19.3	13.1
8.0	5.6	18.5	12.6
6.0	5.1	16.8	11.4
4.0	4.7	15.4	10.5
2.0	4.2	13.7	9.3
1.0	3.9	12.7	8.6

Fence No. 2; Height 8; D_d 200; D_u 100

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	5.5	18.1	12.4
7.5	5.5	18.0	12.2
5.0	5.2	17.0	11.6
3.0	4.8	15.7	10.7
2.0	4.2	13.9	9.5
1.0	2.0	6.5	4.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
10.0	4.8	15.7	10.7
8.0	4.7	15.4	10.5
6.0	4.5	14.6	10.0
4.0	4.3	14.0	9.6
2.0	3.9	12.7	8.7
1.0	3.5	11.6	7.9

Fence No. 1; Height 6; D_d 30; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	5.4	17.8	12.2
6.0	5.3	17.4	11.9
4.5	5.0	16.5	11.3
3.0	4.7	14.5	10.5
2.0	2.8	9.1	6.2
1.0	1.9	6.4	4.3

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	5.2	17.2	11.7
6.0	4.4	14.4	9.8
4.5	3.6	11.8	8.0
3.0	3.3	11.0	7.5
2.0	3.4	11.3	7.7
1.0	3.5	11.3	7.7

Fence No. 1; Height 6; D_d 45; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	4.7	15.4	10.5
6.0	4.6	15.0	10.2
4.5	4.3	14.1	9.6
3.0	4.0	13.1	9.0
2.0	2.8	9.2	6.2
1.0	1.6	5.4	3.7

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	4.5	14.8	10.1
6.0	4.1	13.5	9.2
4.5	3.6	11.9	8.1
3.0	3.2	10.5	7.2
2.0	3.0	9.9	6.8
1.0	2.8	9.3	6.3

Fence No. 1; Height 6; D_d 60; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	4.8	15.9	10.8
6.0	4.7	15.3	10.5
4.5	4.4	14.6	9.9
3.0	4.1	13.6	9.3
2.0	2.0	6.5	4.4
1.0	1.7	5.5	3.8

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	4.1	13.5	9.2
6.0	3.8	12.6	8.6
4.5	3.4	11.3	7.7
3.0	3.2	10.6	7.2
2.0	3.0	10.0	6.8
1.0	2.8	9.3	6.3

Fence No. 1; Height 6; D_d 75; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	5.5	18.0	12.3
6.0	5.4	17.6	12.0
4.5	5.1	16.7	11.4
3.0	4.8	15.6	10.7
2.0	2.5	8.4	5.7
1.0	2.0	6.5	4.4

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	5.7	18.6	12.7
6.0	5.3	17.4	11.8
4.5	4.8	15.8	10.8
3.0	4.4	14.5	9.9
2.0	4.1	13.3	9.1
1.0	3.7	12.3	8.4

Fence No. 1; Height 6; D_d 90; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	5.4	17.6	12.0
6.0	5.2	17.1	11.6
4.5	5.0	16.3	11.1
3.0	4.6	15.2	10.4
2.0	2.9	9.4	6.4
1.0	1.9	6.3	4.3

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	5.0	16.3	11.1
6.0	4.7	15.6	10.6
4.5	4.4	14.5	9.9
3.0	4.2	13.7	9.4
2.0	3.9	12.6	8.6
1.0	3.5	11.6	7.9

Fence No. 1; Height 6; D_d 150; D_u 160

Upstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	4.8	15.9	10.8
6.0	4.7	15.4	10.5
4.5	4.5	14.8	10.1
3.0	4.3	14.0	9.6
2.0	2.5	8.3	5.6
1.0	1.8	5.9	4.0

Downstream

Elev.	Velocity		
	MPS	FPS	MPH
8.0	4.6	14.9	10.2
6.0	4.4	14.6	9.9
4.5	4.2	13.9	9.5
3.0	4.1	13.3	9.1
2.0	3.8	12.5	8.5
1.0	3.3	11.0	7.5

TABLE IV

Percent reduction of mean wind without snow accumulation is given on pages 49 through 53 Appendix.

Fence Height 16 Feet

Location	Downstream Distance (Feet)	Percent Reduction of Mean Wind
1	40	43.3
1	80	19.6*
1	160	-- *
3	40	41.1
3	80	40.3
3	160	12.8
9	40	50.1
9	80	43.6
9	160	41.2
10	40	48.1
10	80	41.8
10	160	34.0
Average Percent Reduction	40	45.6
	80	41.9
	160	29.3

* Data not used in analysis.

Fence Height 12 Feet

Location	Downstream Distance (Feet)	Percent Reduction of Mean Wind
4	30	33.7
4	60	38.2
4	120	31.9
7	30	39.0
7	60	33.0
7	120	31.4
8	30	40.7
8	60	35.9
8	120	33.0
10	30	37.8
10	60	39.4
10	120	12.0
Average Percent Reduction	30	37.8
	60	36.6
	120	27.1

Fence Height 10 Feet

Location	Downstream Distance (Feet)	Percent Reduction of Mean Wind
2	25	30.1
2	50	25.5
2	100	18.6
3	25	27.6
3	50	16.4*
3	100	-- *
5	25	39.1
5	50	38.3
5	100	31.5
7	25	38.1
7	50	27.4
7	100	28.4
Average Percent Reduction	25	33.7
	50	30.4
	100	26.2

* Data not used in analysis.

Fence Height 8 Feet

Location	Downstream Distance (Feet)	Percent Reduction of Mean Wind
2	20	14.0*
2	40	-- *
2	80	-- *
4	20	31.2
4	40	28.9
4	80	26.8
6	20	31.8
6	40	27.1
6	80	29.2
9	20	39.2
9	40	30.2
9	80	29.2
Average Percent Reduction	20	34.1
	40	28.7
	80	28.4

* Data not used in analysis.

Fence Height 6 Feet

Location	Downstream Distance (Feet)	Percent Reduction of Mean Wind
1	15	27.0
1	30	13.3*
1	60	-- *
5	15	29.2
5	30	27.8
5	60	24.4
6	15	32.3
6	30	26.1
6	60	19.0
8	15	18.1
8	30	22.5
8	60	6.8
Average Percent Reduction	15	26.6
	30	25.5
	60	16.7

* Data not used in analysis.

TABLE V

Percent reduction of mean wind with snow accumulation is given on pages 55 through 59 Appendix.

Fence Height 16 Feet

Location	Downstream Distance (Feet)	Effective Height (Feet)	Percent Reduction of Mean Wind
10	38	16.0	37.0
10	80	10.7	23.8
10	120	10.6	25.3
10	160	16.0	40.3
10	200	16.0	19.6
10	240	16.0	--

Fence Height 12 Feet

Location	Downstream Distance (Feet)	Effective Height (Feet)	Percent Reduction of Mean Wind
10	44	11.4	32.9
10	60	8.9	22.4
10	90	7.5	11.1
10	120	8.3	--
10	150	10.7	19.5
10	180	12.0	13.6

Fence Height 10 Feet

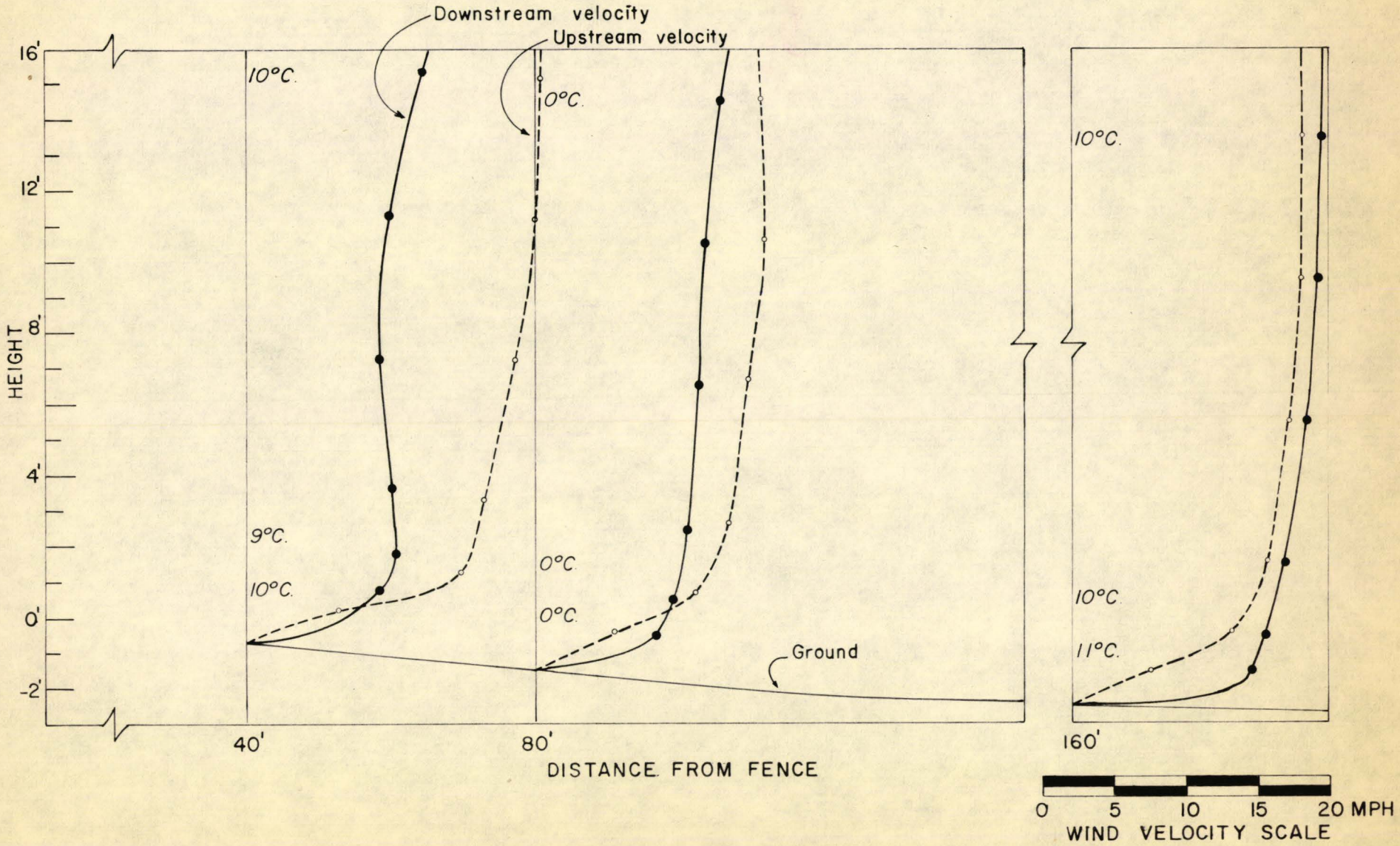
Location	Downstream Distance (Feet)	Effective Height (Feet)	Percent Reduction of Mean Wind
2	50	8.7	13.0
2	75	6.2	5.9
2	100	6.7	7.6
2	125	8.5	17.4
2	150	10.0	16.2
2	205	10.0	--

Fence Height 8 Feet

Location	Downstream Distance (Feet)	Effective Height (Feet)	Percent Reduction of Mean Wind
2	40	7.2	20.3
2	60	5.2	13.7
2	80	5.6	--
2	100	6.6	5.3
2	120	7.7	2.8
2	200	8.0	11.1

Fence Height 6 Feet

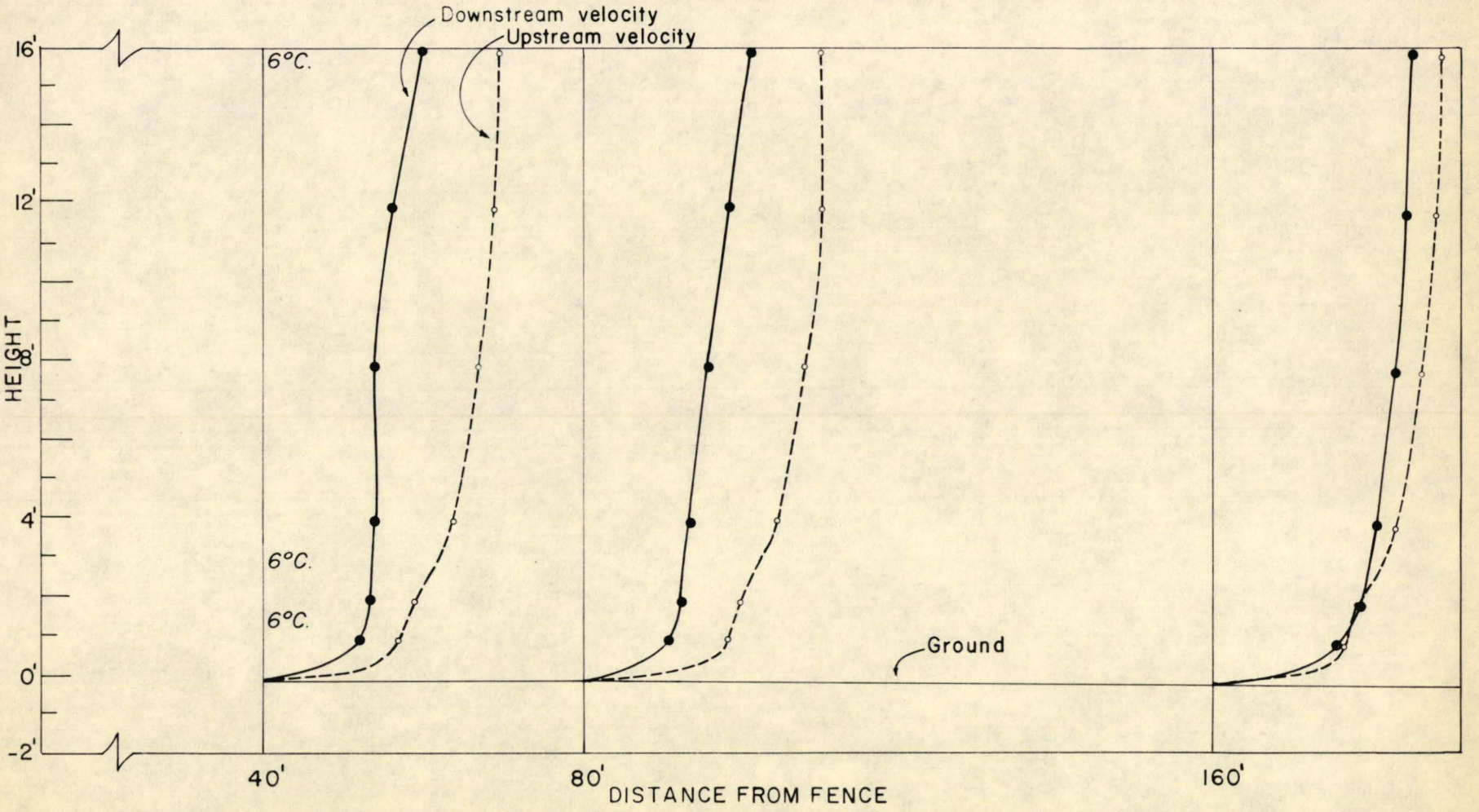
Location	Downstream Distance (Feet)	Effective Height (Feet)	Percent Reduction of Mean Wind
1	30	5.8	13.7
1	45	5.0	--
1	60	4.6	--
1	75	4.7	--
1	90	5.0	--
1	150	6.0	--



VELOCITY PROFILE

16' FENCE-LOCATION NO. 1

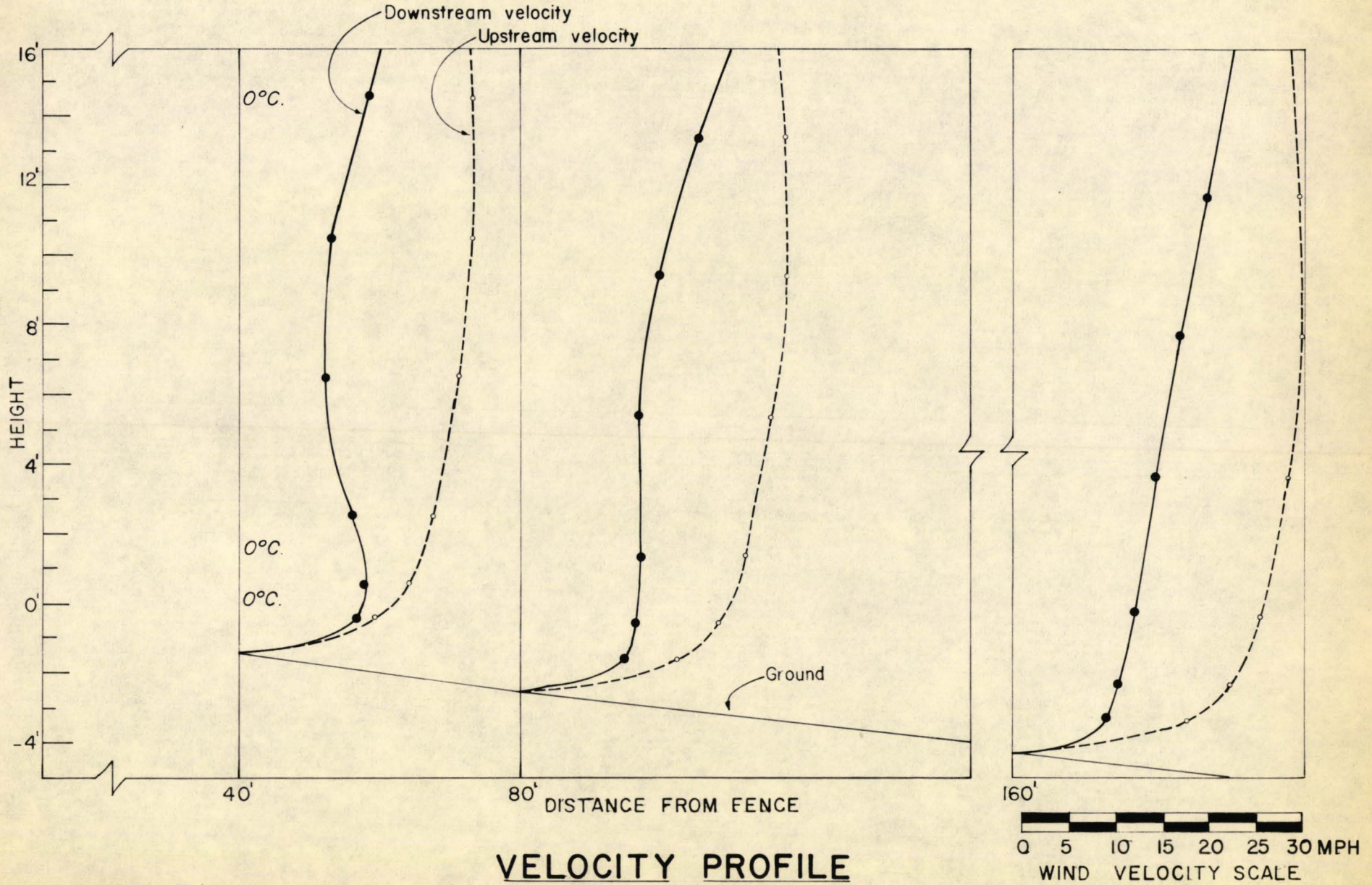
Figure 15



VELOCITY PROFILE

16' FENCE-LOCATION NO. 3

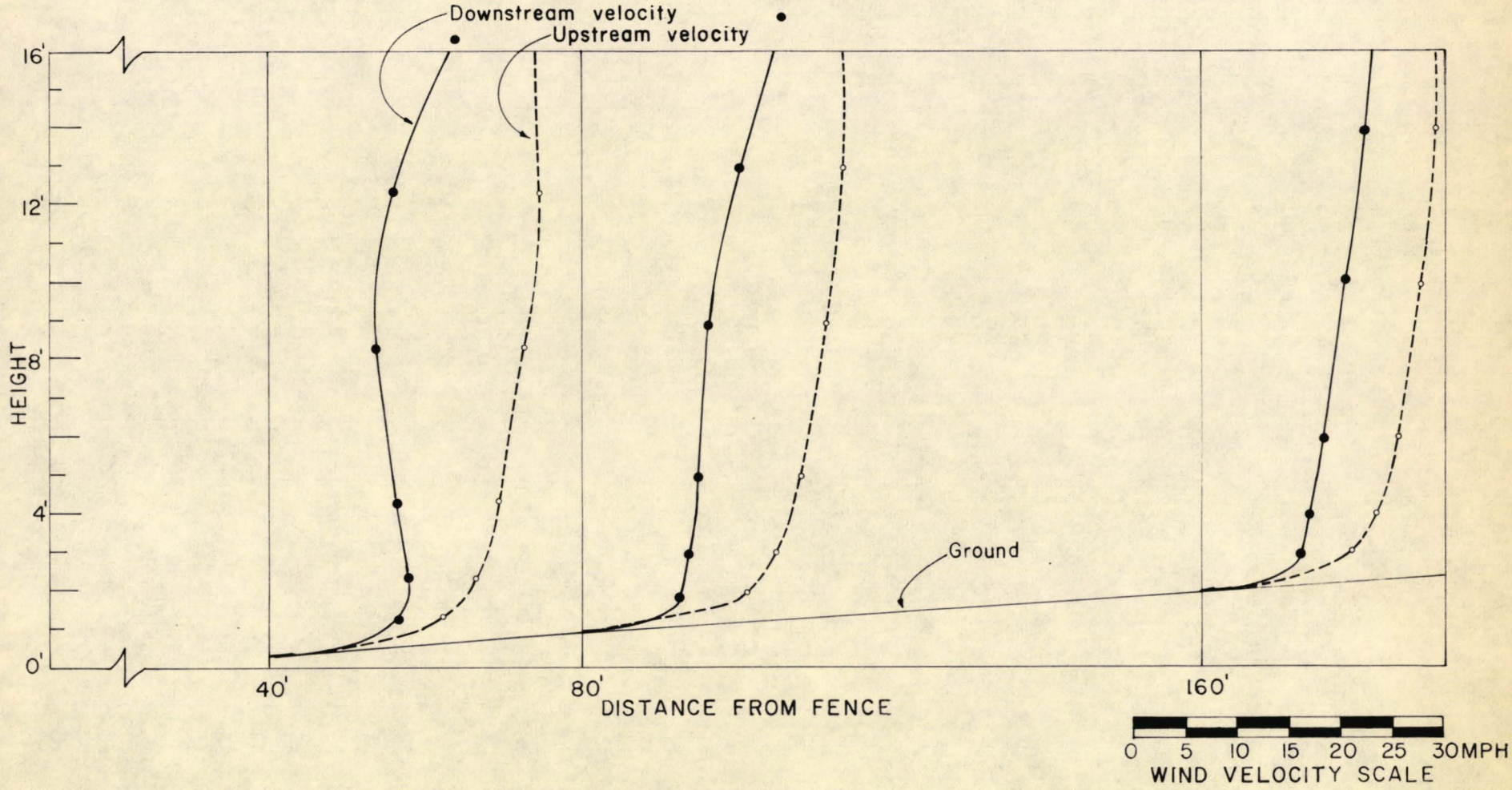
Figure 16



VELOCITY PROFILE

16' FENCE-LOCATION NO. 9

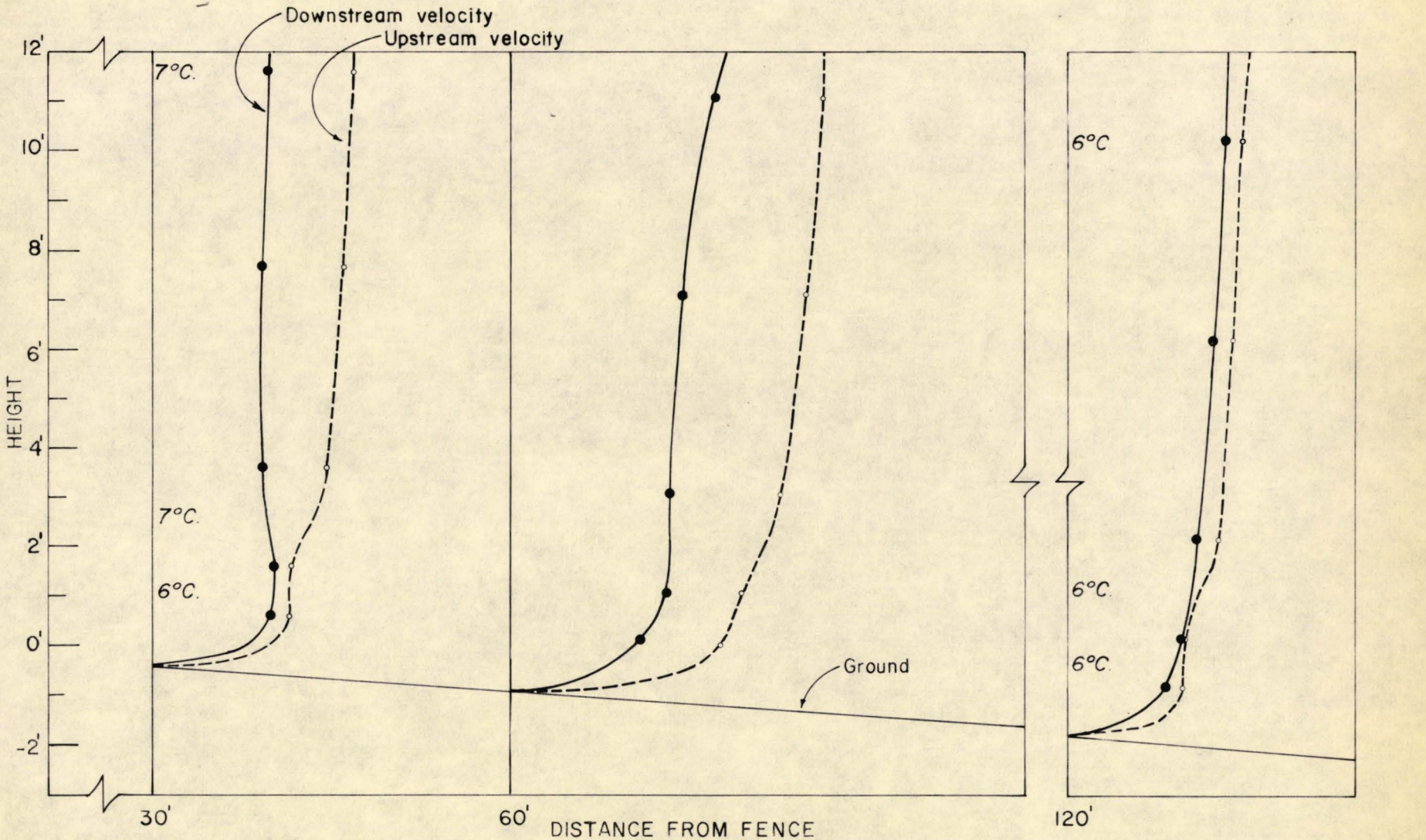
Figure 17



VELOCITY PROFILE

16' FENCE-LOCATION NO. 10

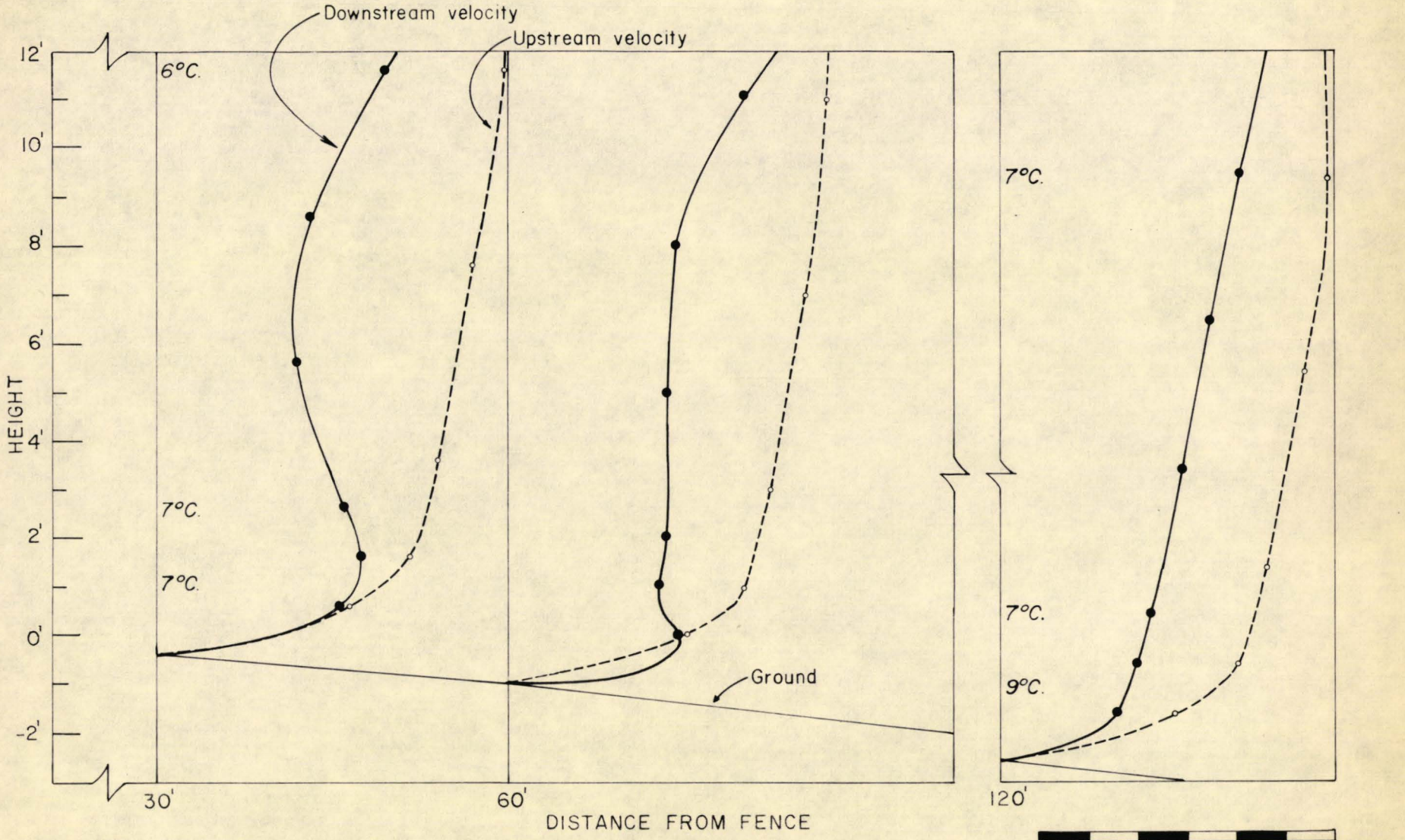
Figure 18



VELOCITY PROFILE

12' FENCE-LOCATION NO. 4

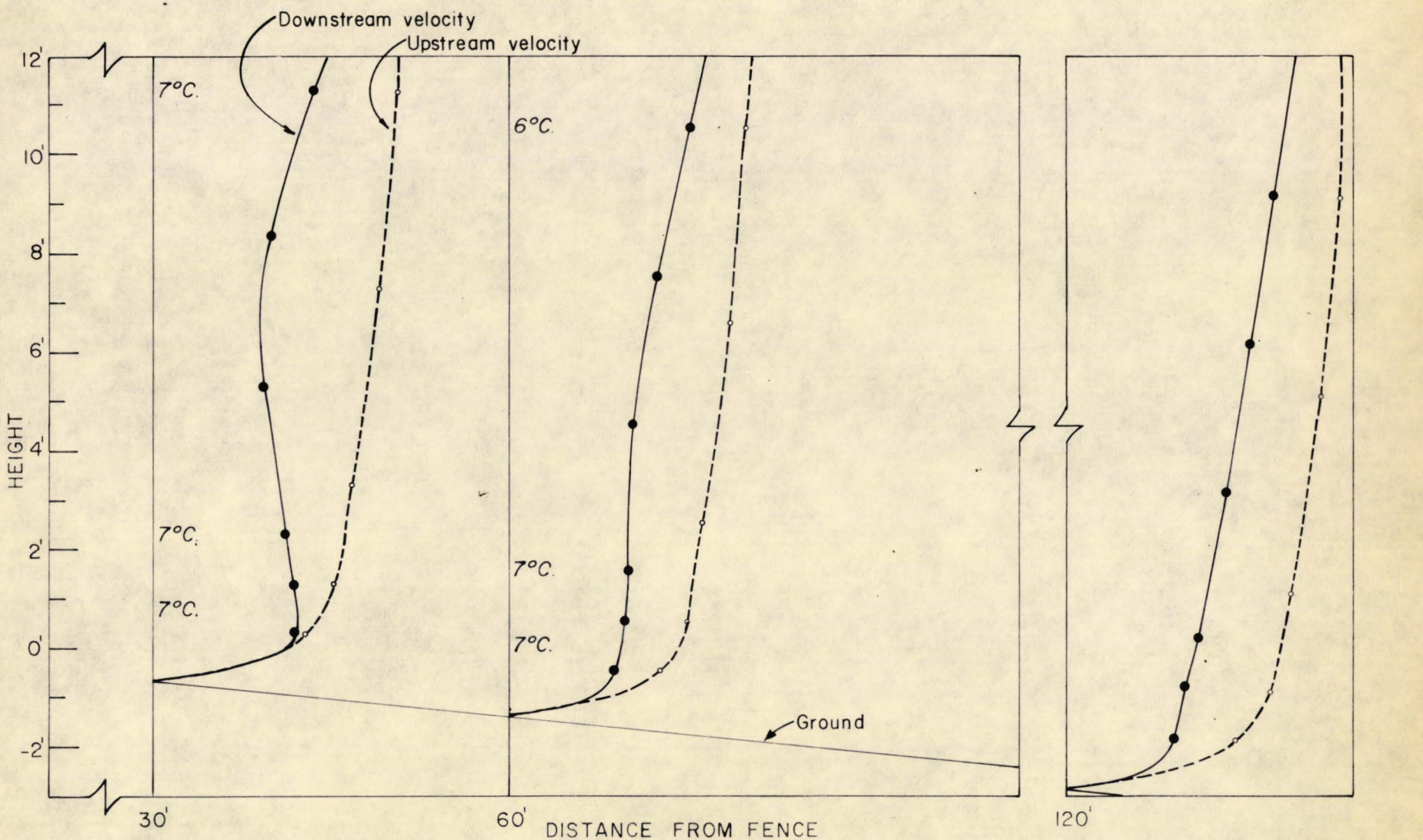
Figure 19



VELOCITY PROFILE

12' FENCE - LOCATION NO. 7

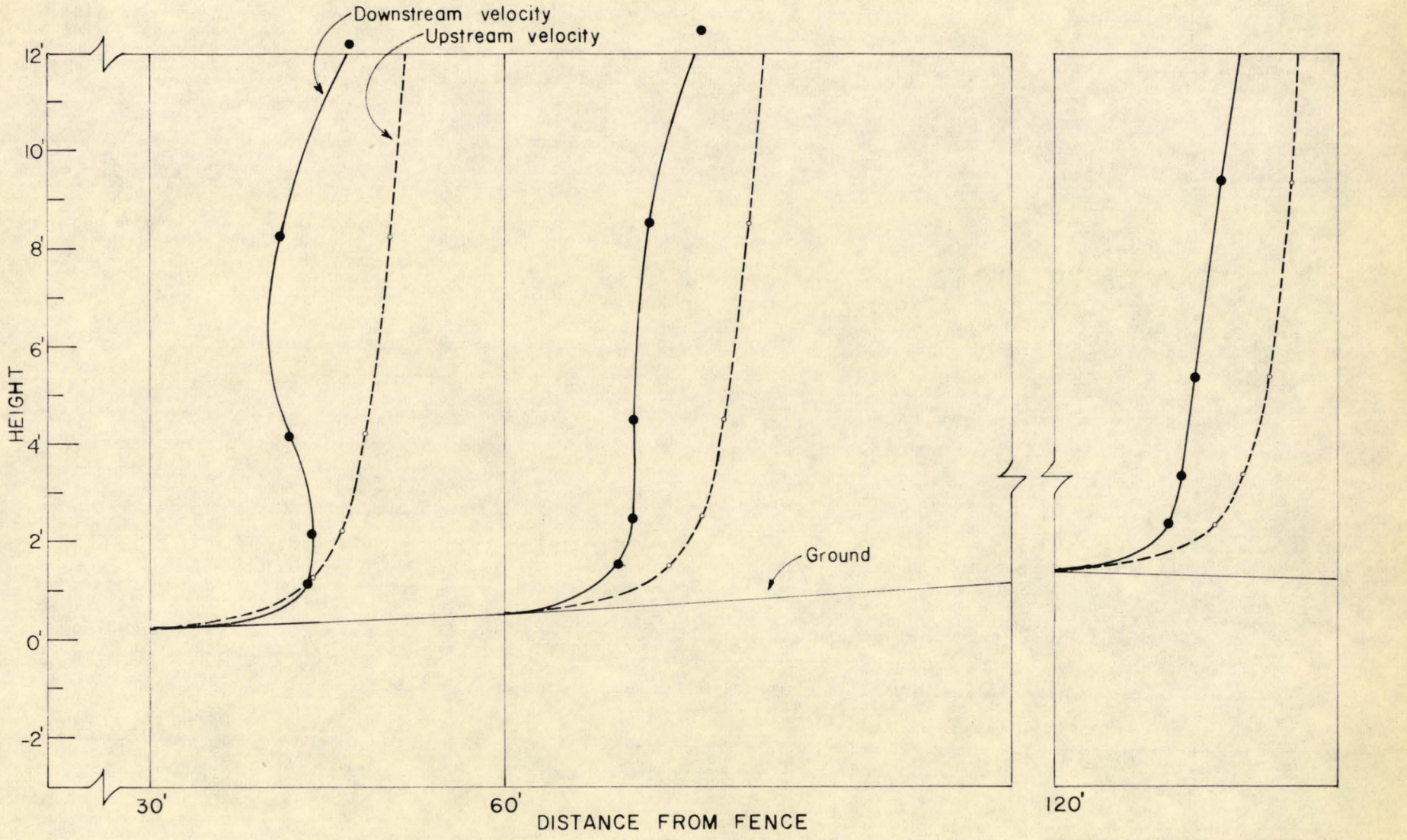
Figure 20



VELOCITY PROFILE

12' FENCE-LOCATION NO. 8'

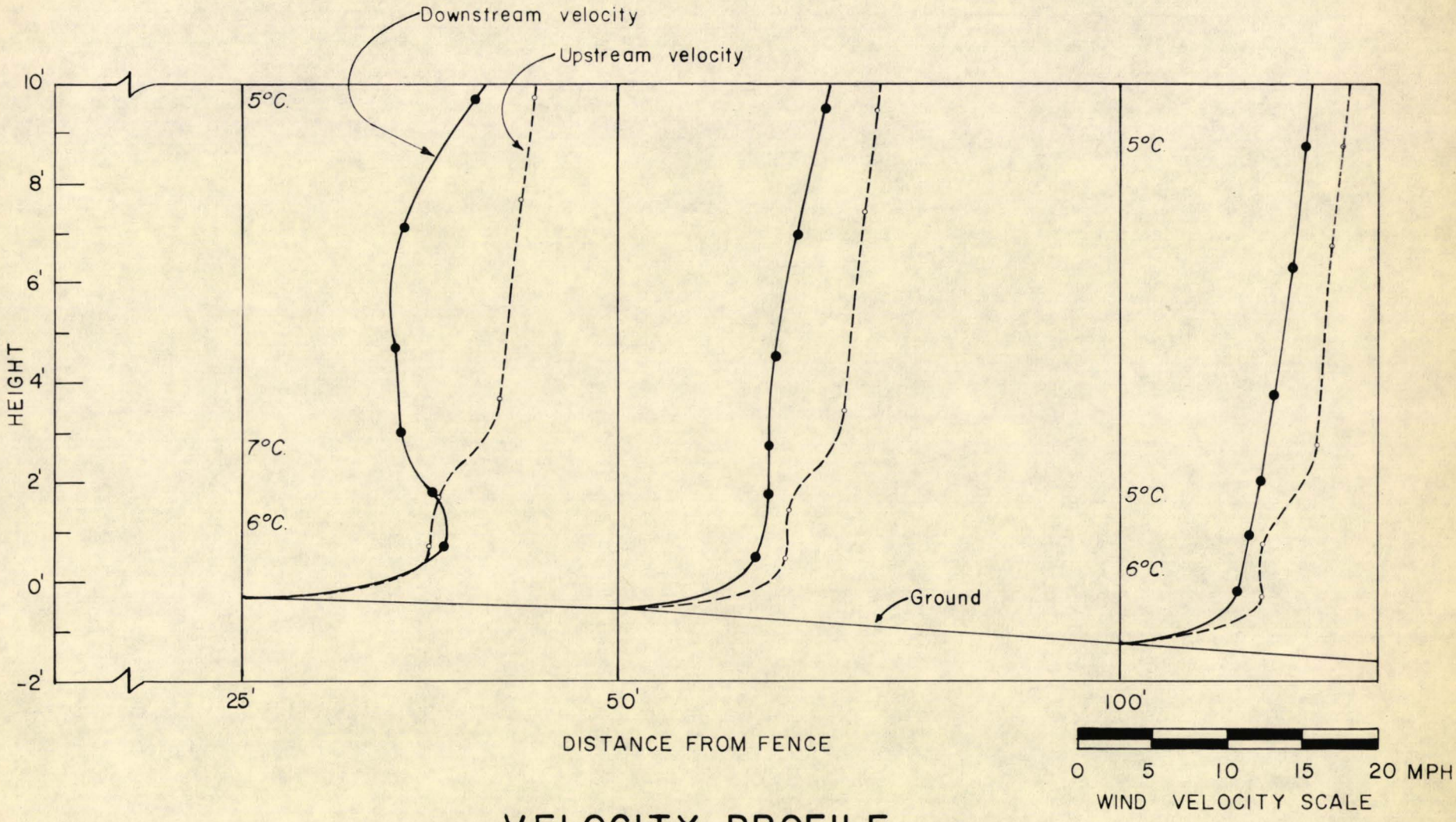
Figure 21



VELOCITY PROFILE

12' FENCE-LOCATION NO. 10

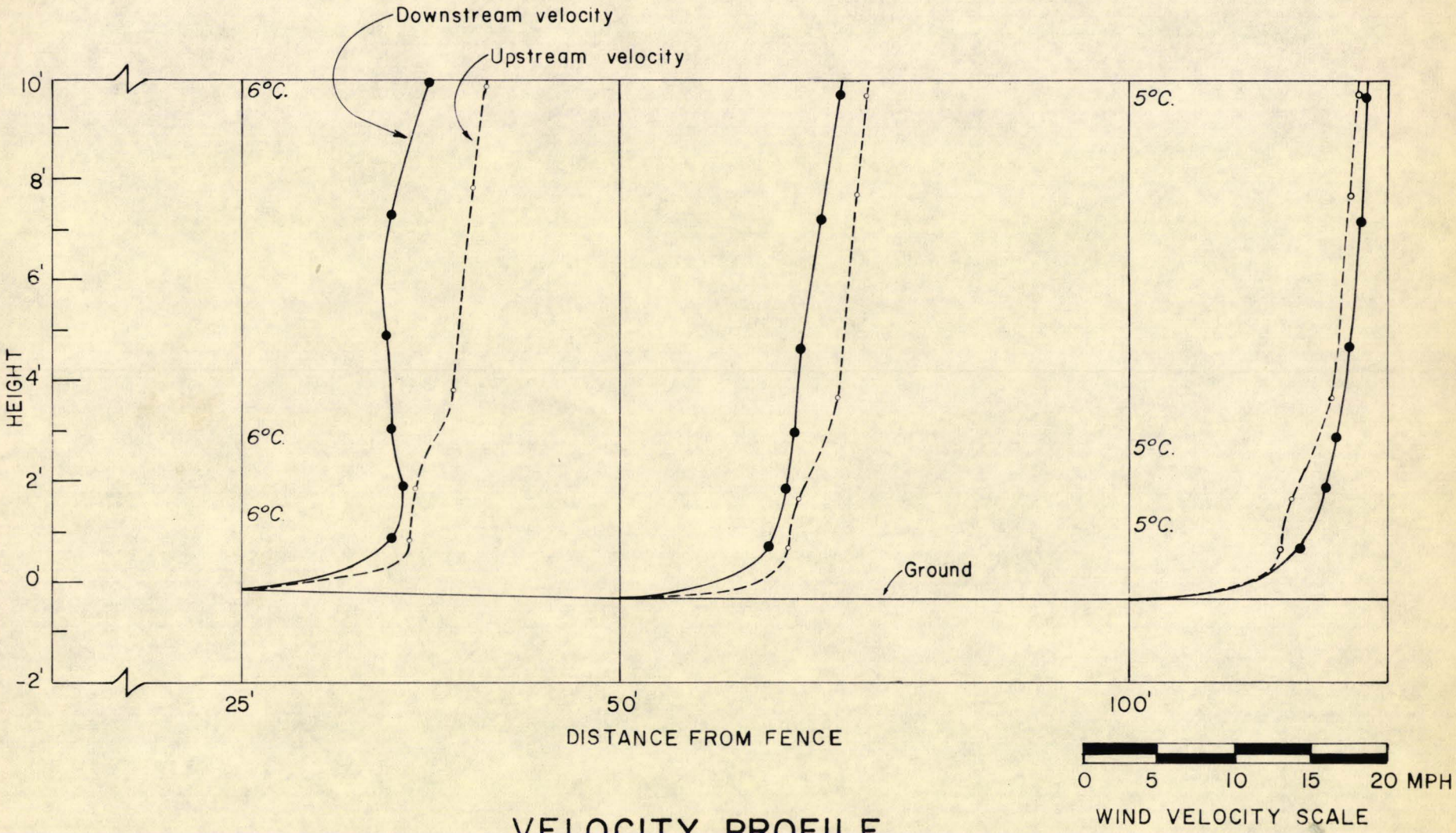
Figure 22



VELOCITY PROFILE

10' FENCE-LOCATION NO. 2

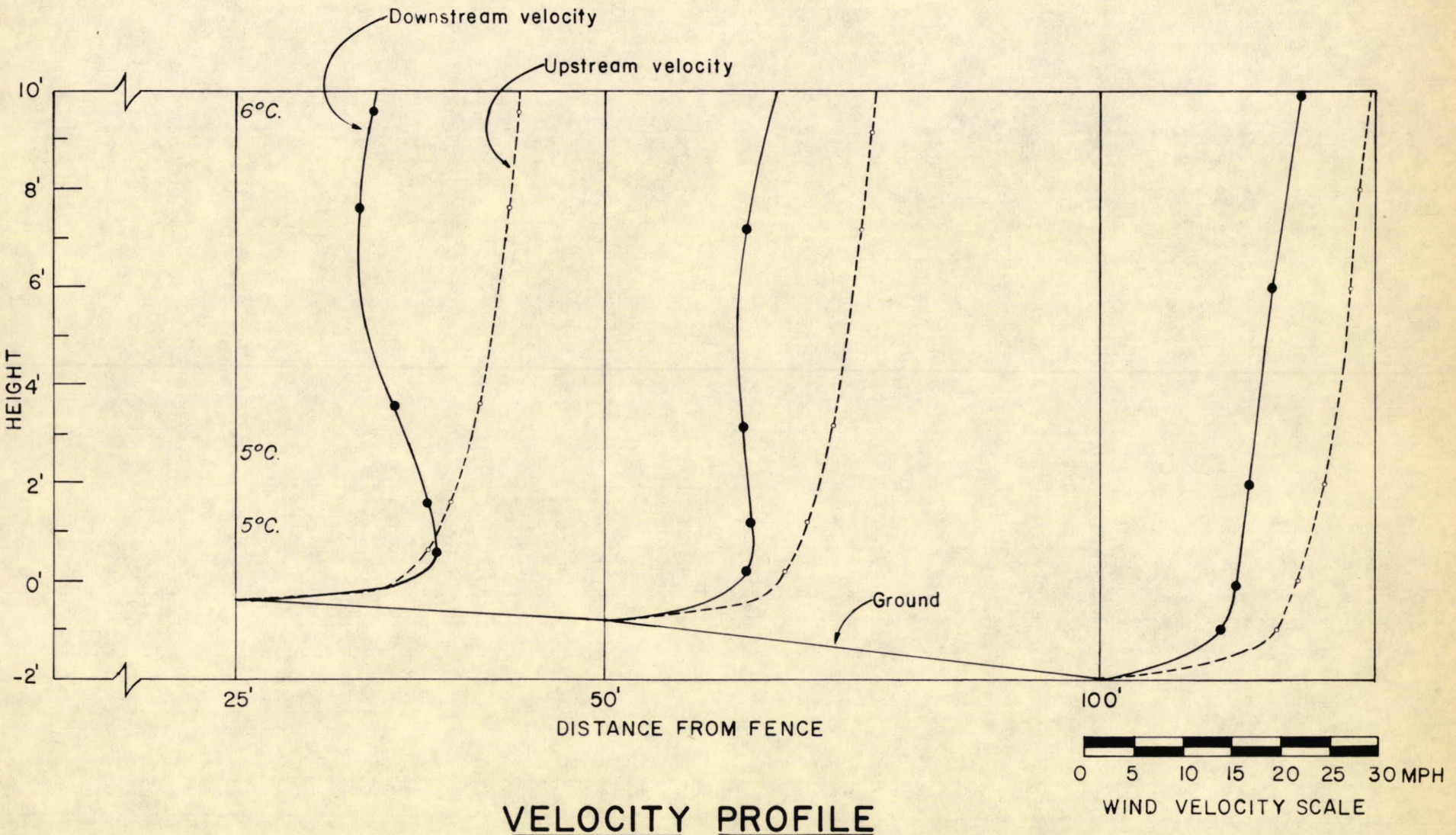
Figure 23



VELOCITY PROFILE

10' FENCE - LOCATION NO. 3

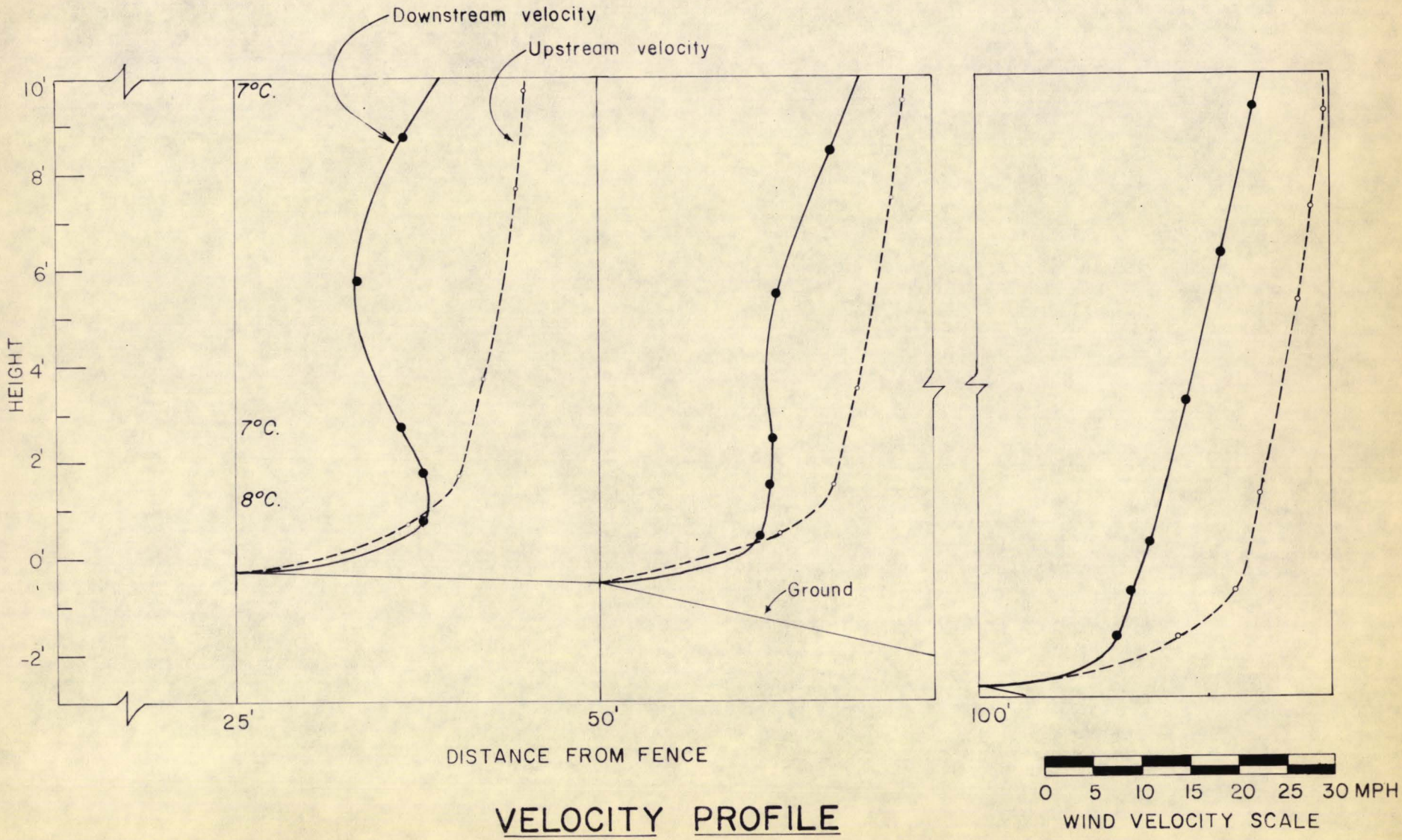
Figure 24



VELOCITY PROFILE

10' FENCE-LOCATION NO. 5

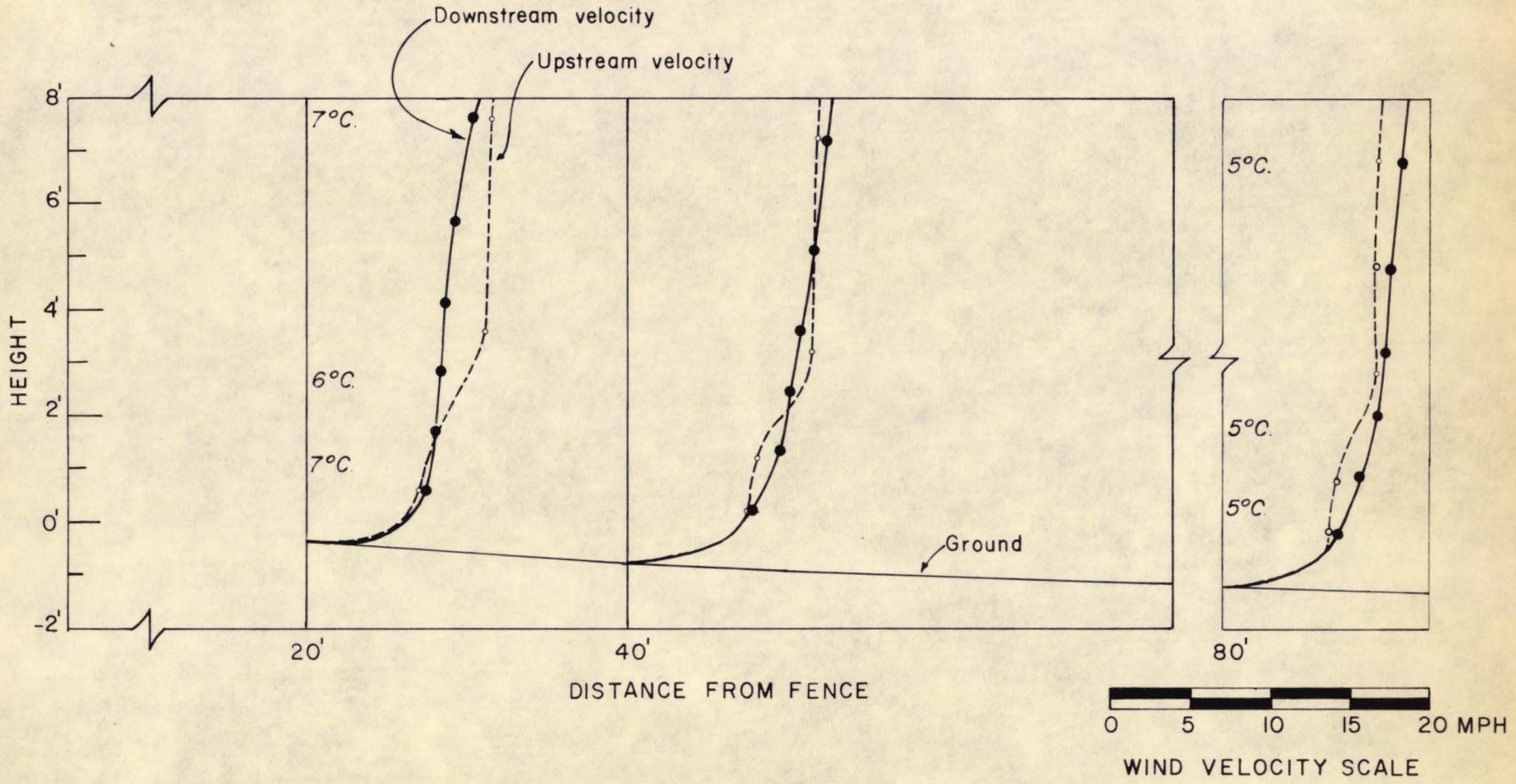
Figure 25



VELOCITY PROFILE

10' FENCE-LOCATION NO. 7

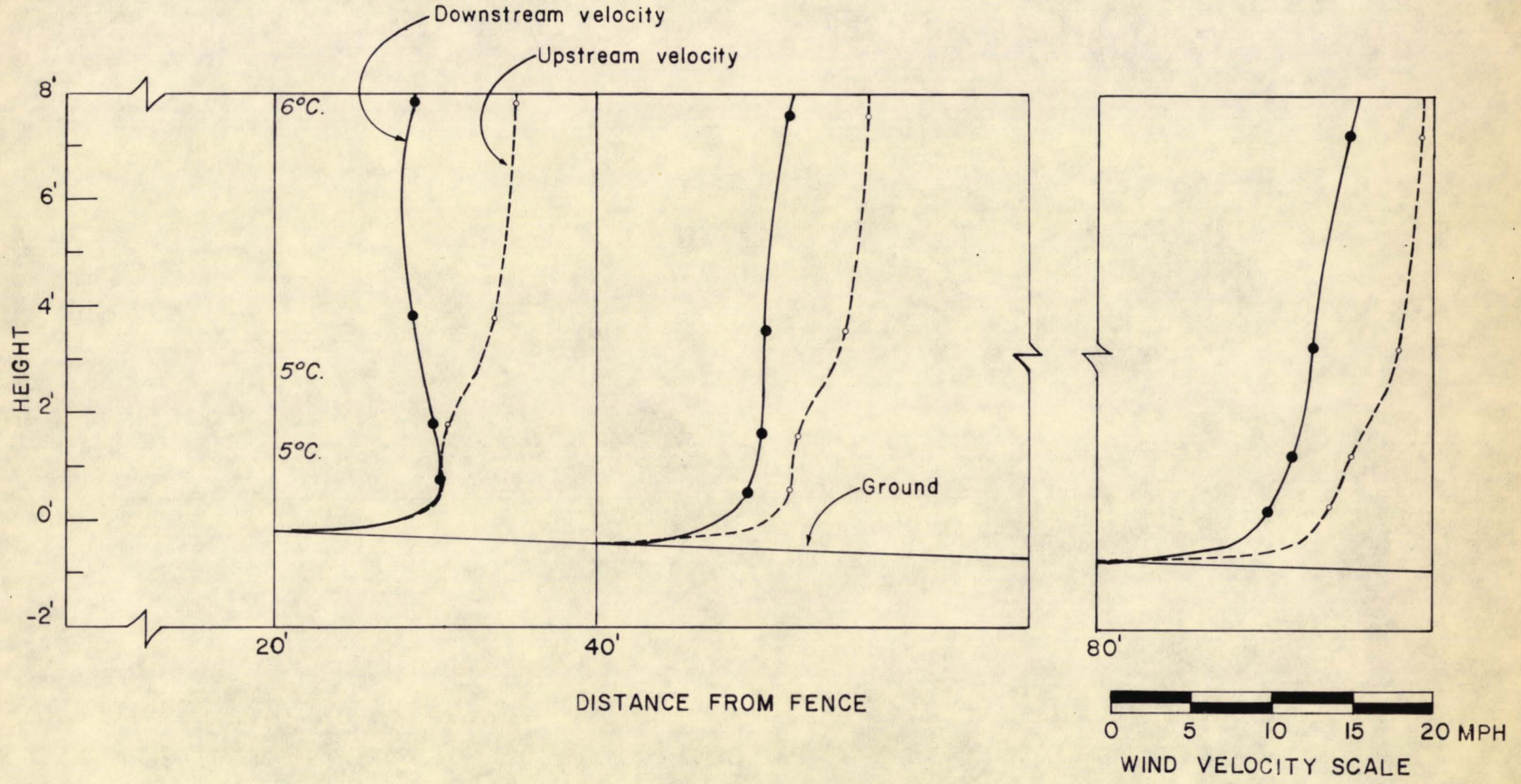
Figure 26



VELOCITY PROFILE

8' FENCE-LOCATION NO. 2

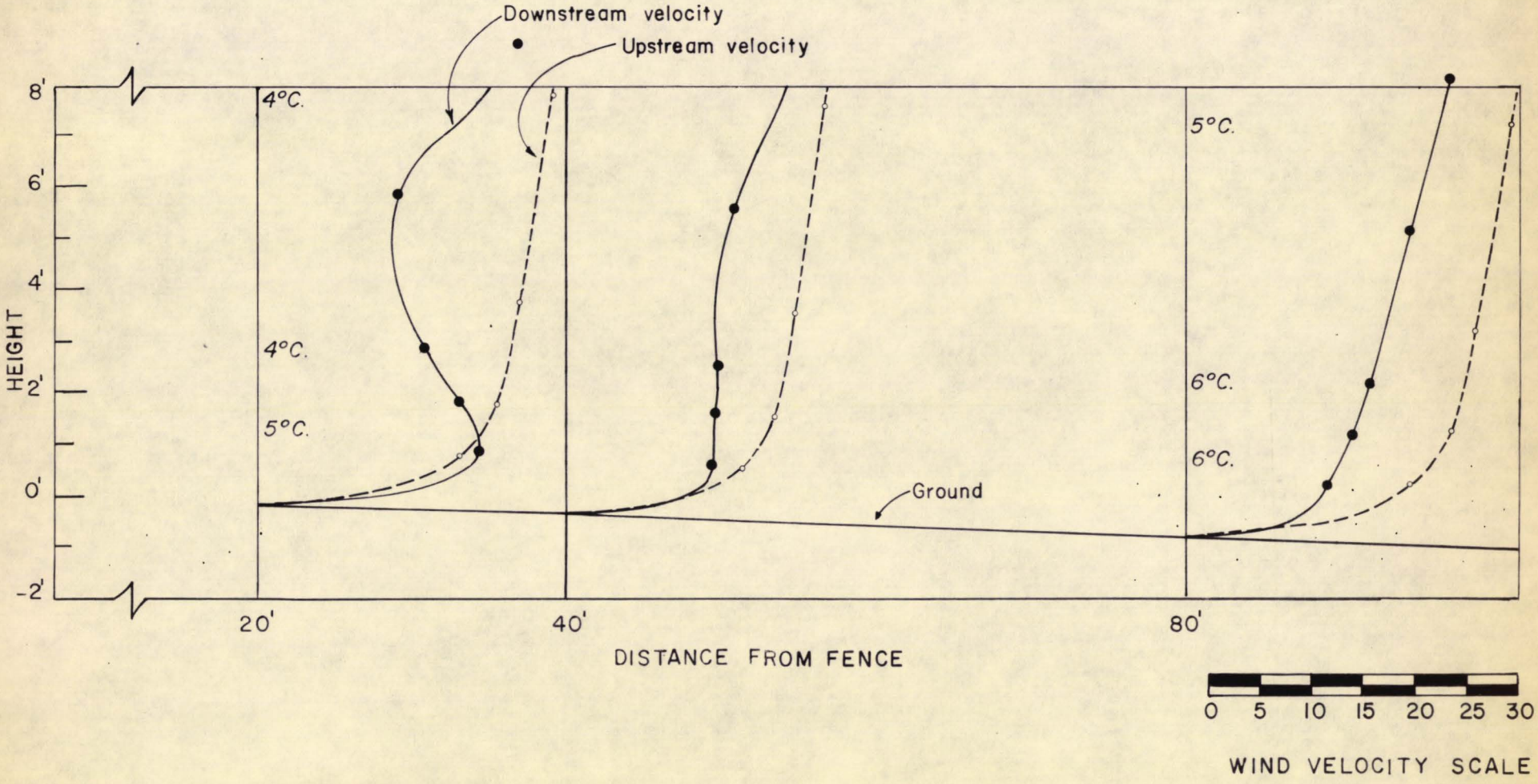
Figure 27



VELOCITY PROFILE

8' FENCE-LOCATION NO. 4

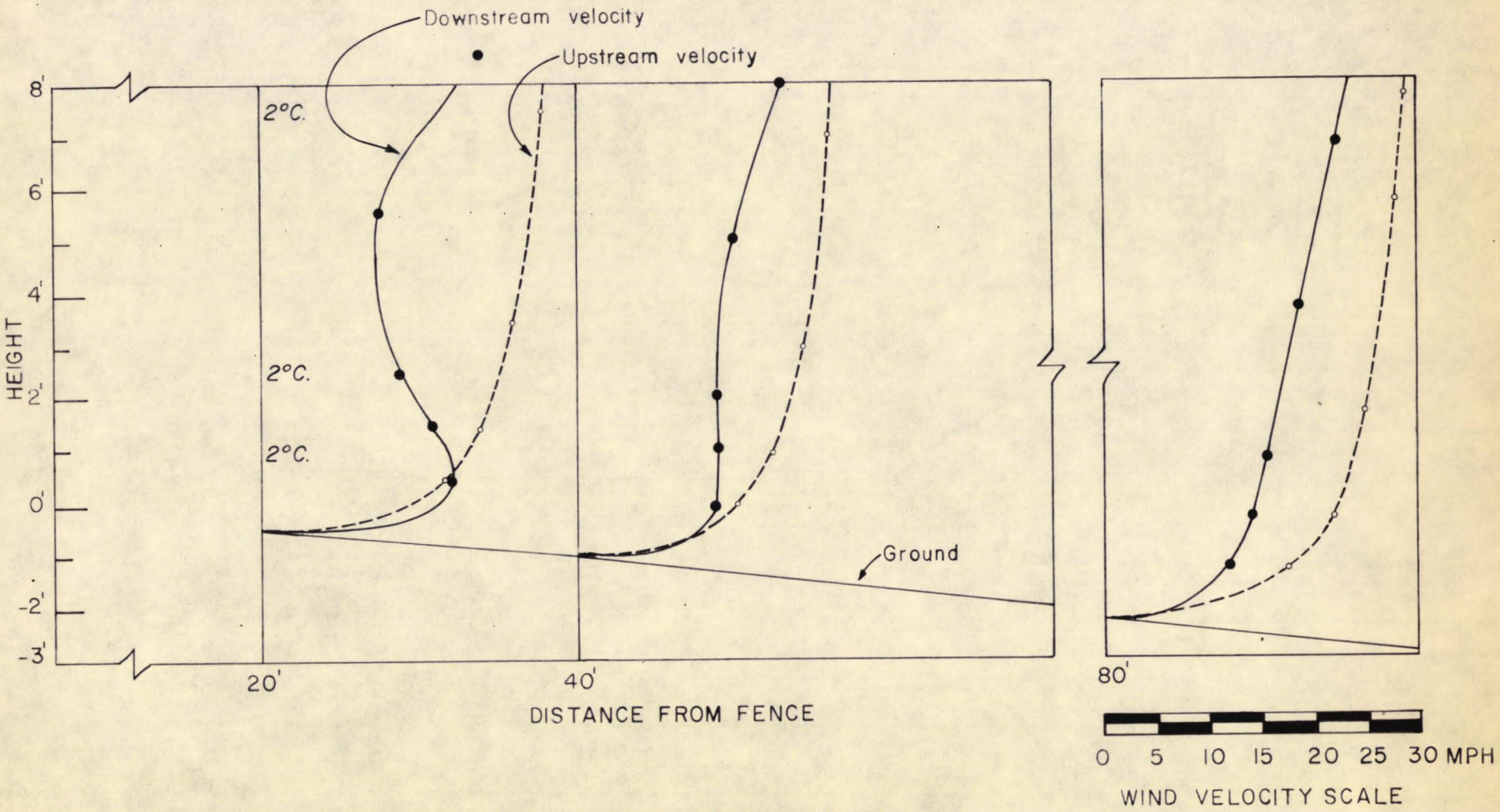
Figure 28



VELOCITY PROFILE

8' FENCE-LOCATION NO. 6

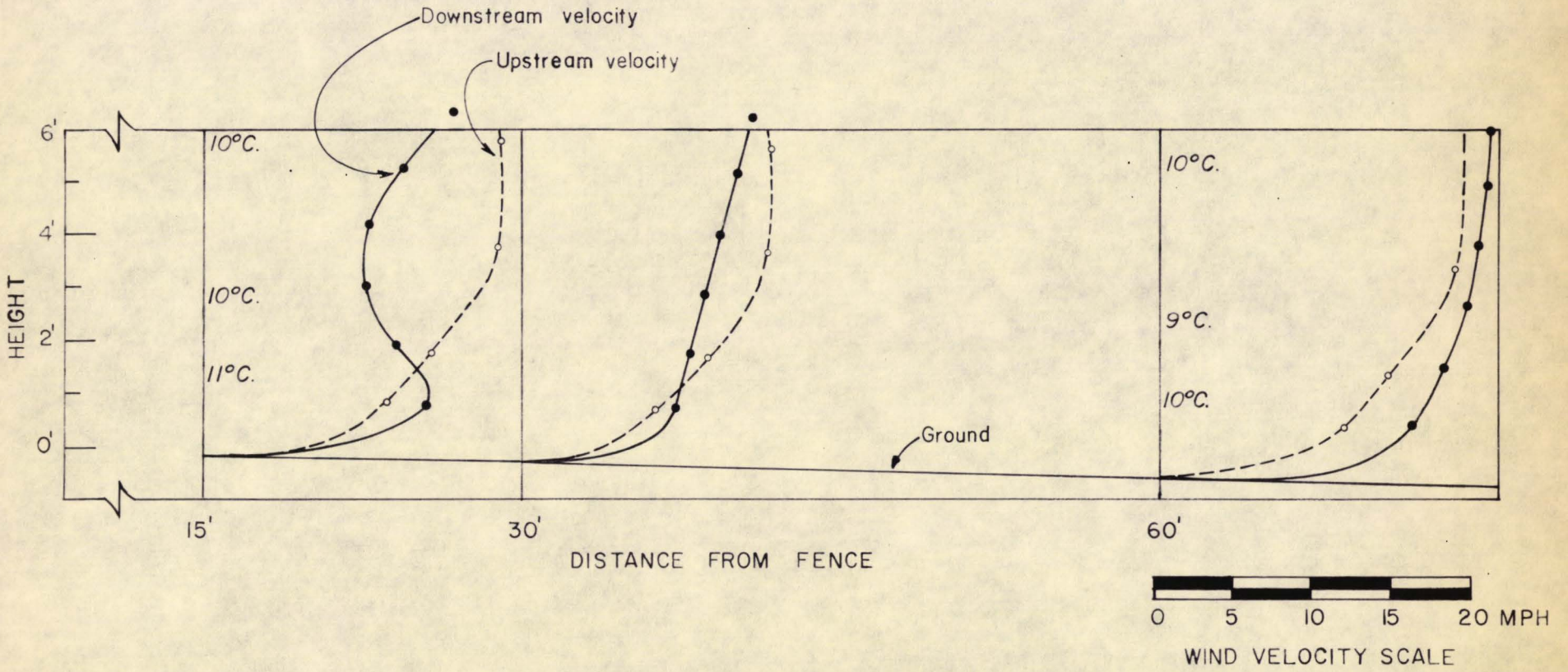
Figure 29



VELOCITY PROFILE

8' FENCE-LOCATION NO 9

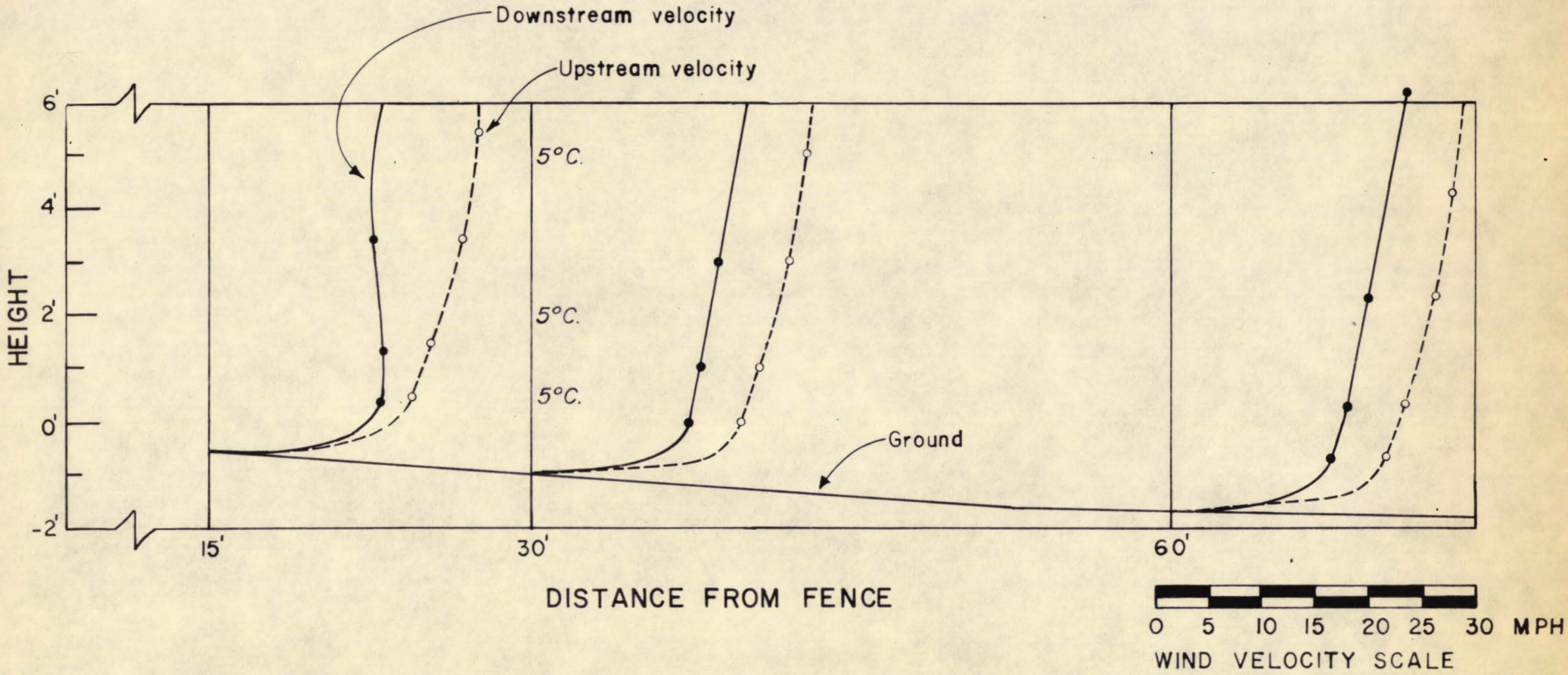
Figure 30



VELOCITY PROFILE

6' FENCE - LOCATION NO. 1

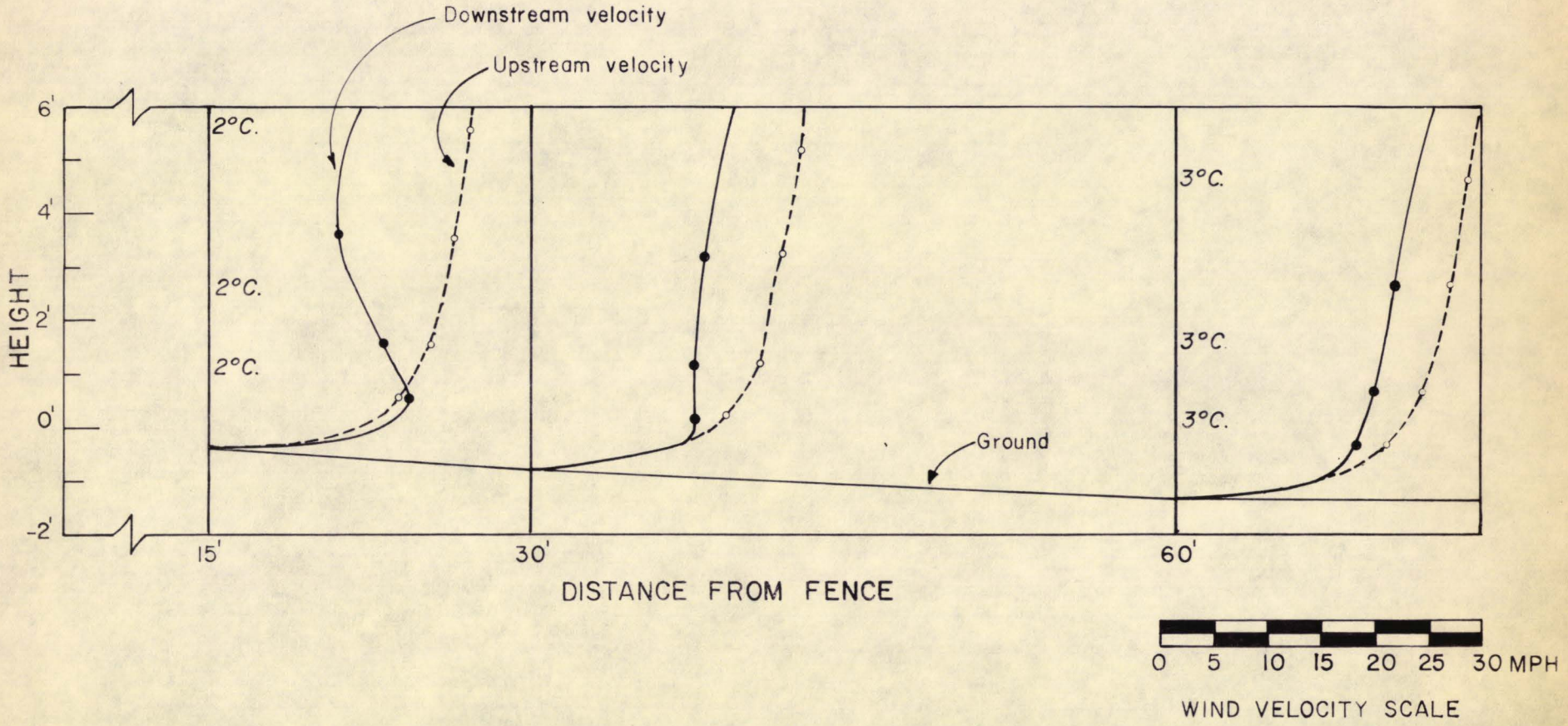
Figure 31



VELOCITY PROFILE

6' FENCE - LOCATION NO. 5

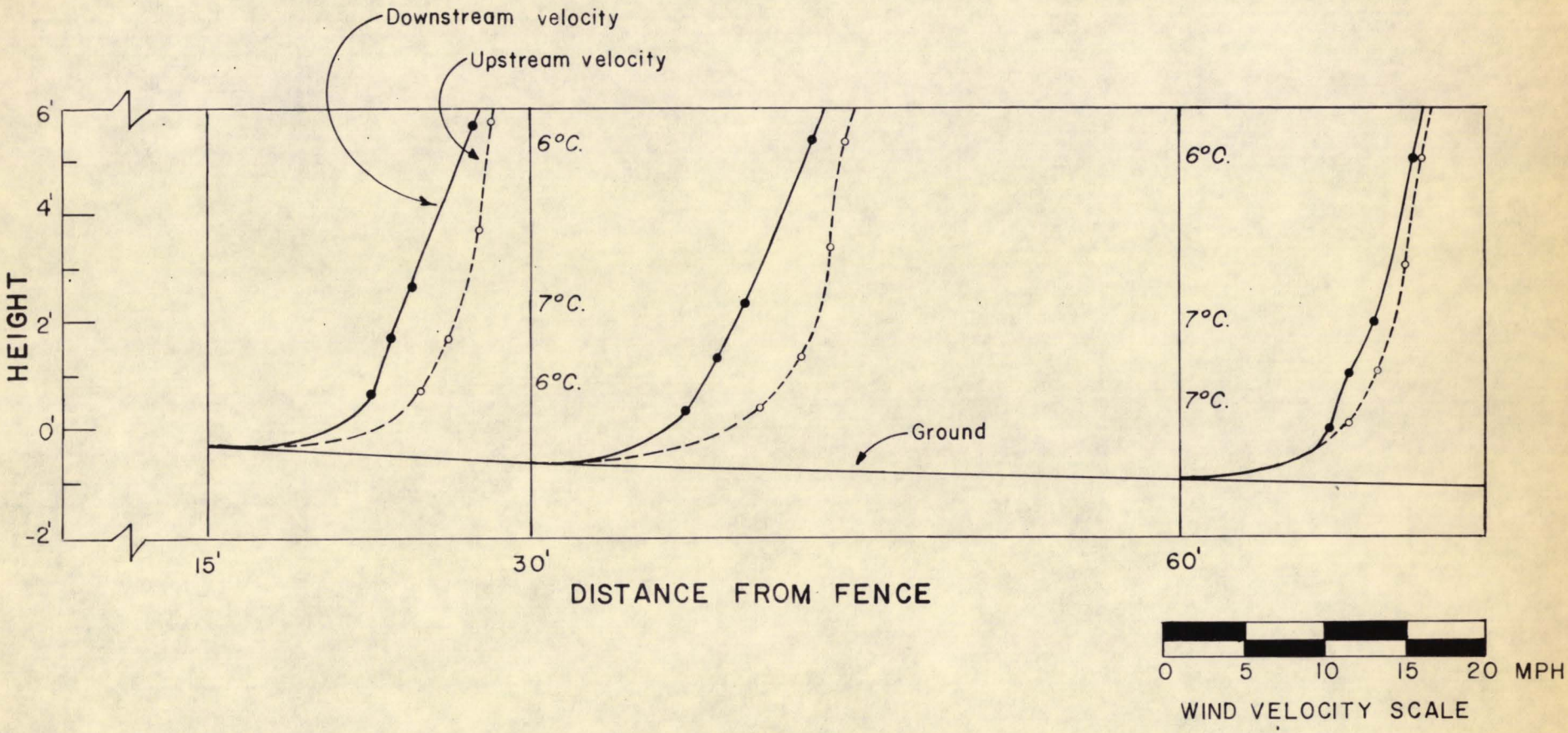
Figure 32



VELOCITY PROFILE

6' FENCE-LOCATION NO. 6

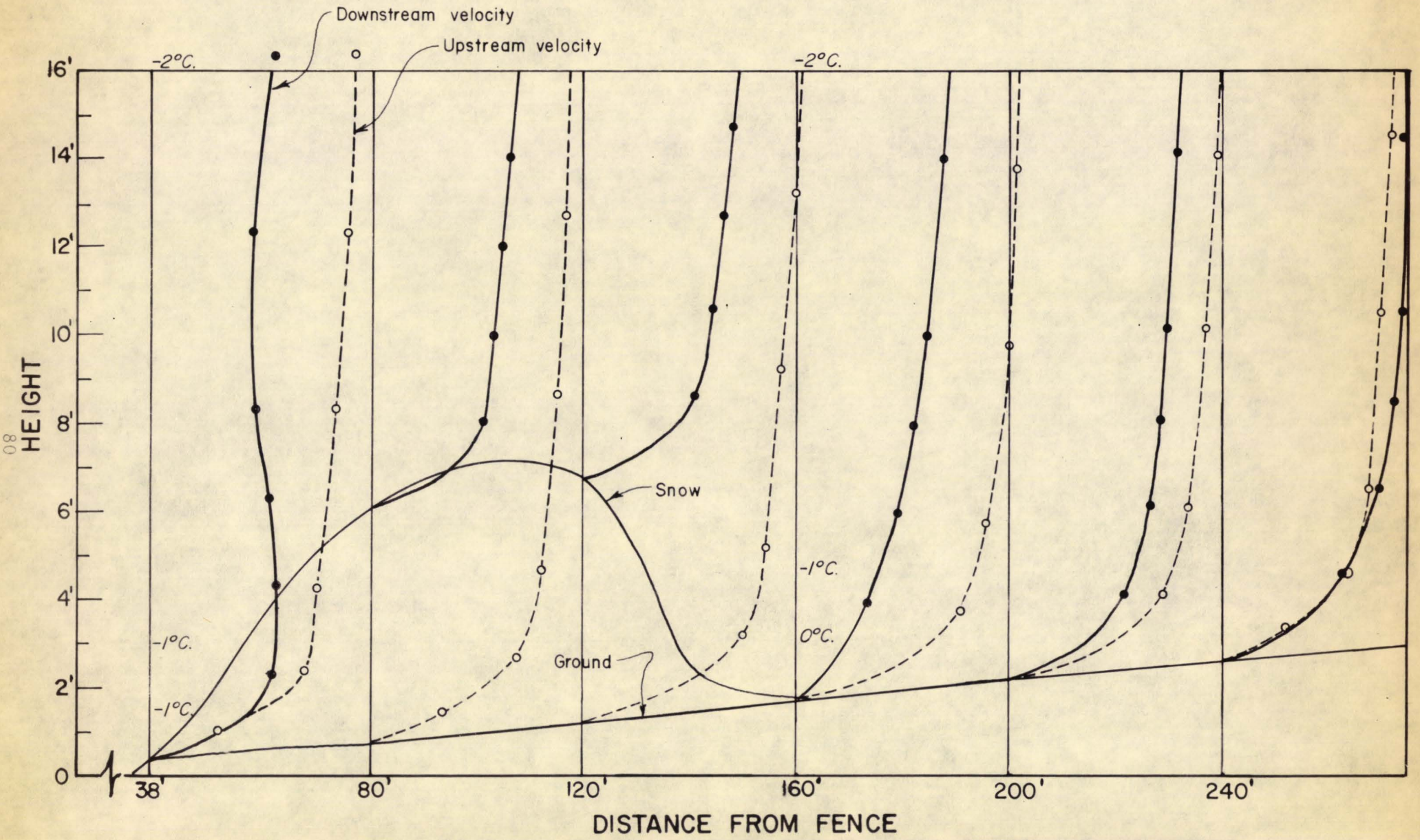
Figure 33



VELOCITY PROFILE

6' FENCE - LOCATION NO. 8

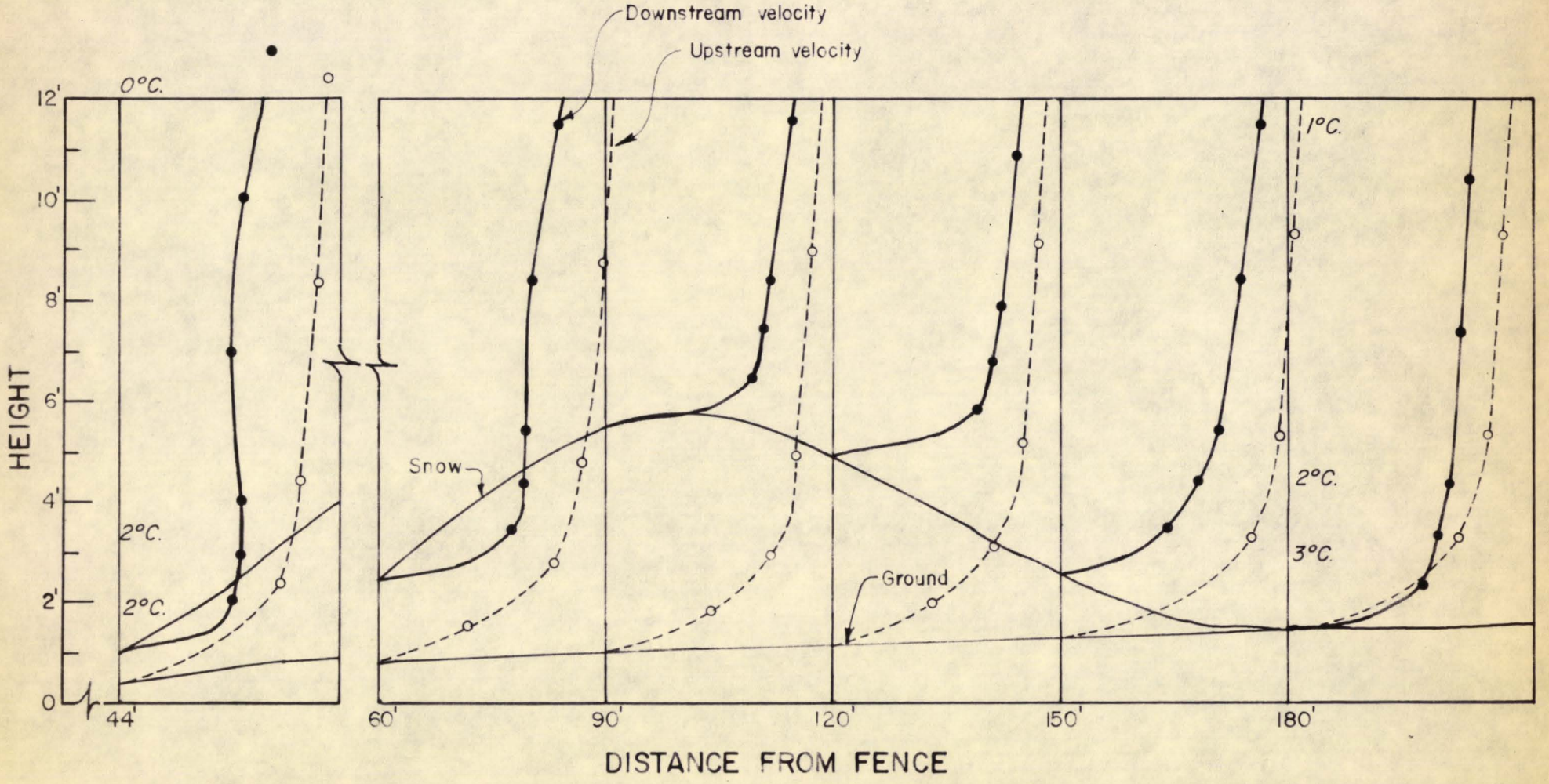
Figure 34



VELOCITY PROFILE

16' FENCE - LOCATION NO. 10

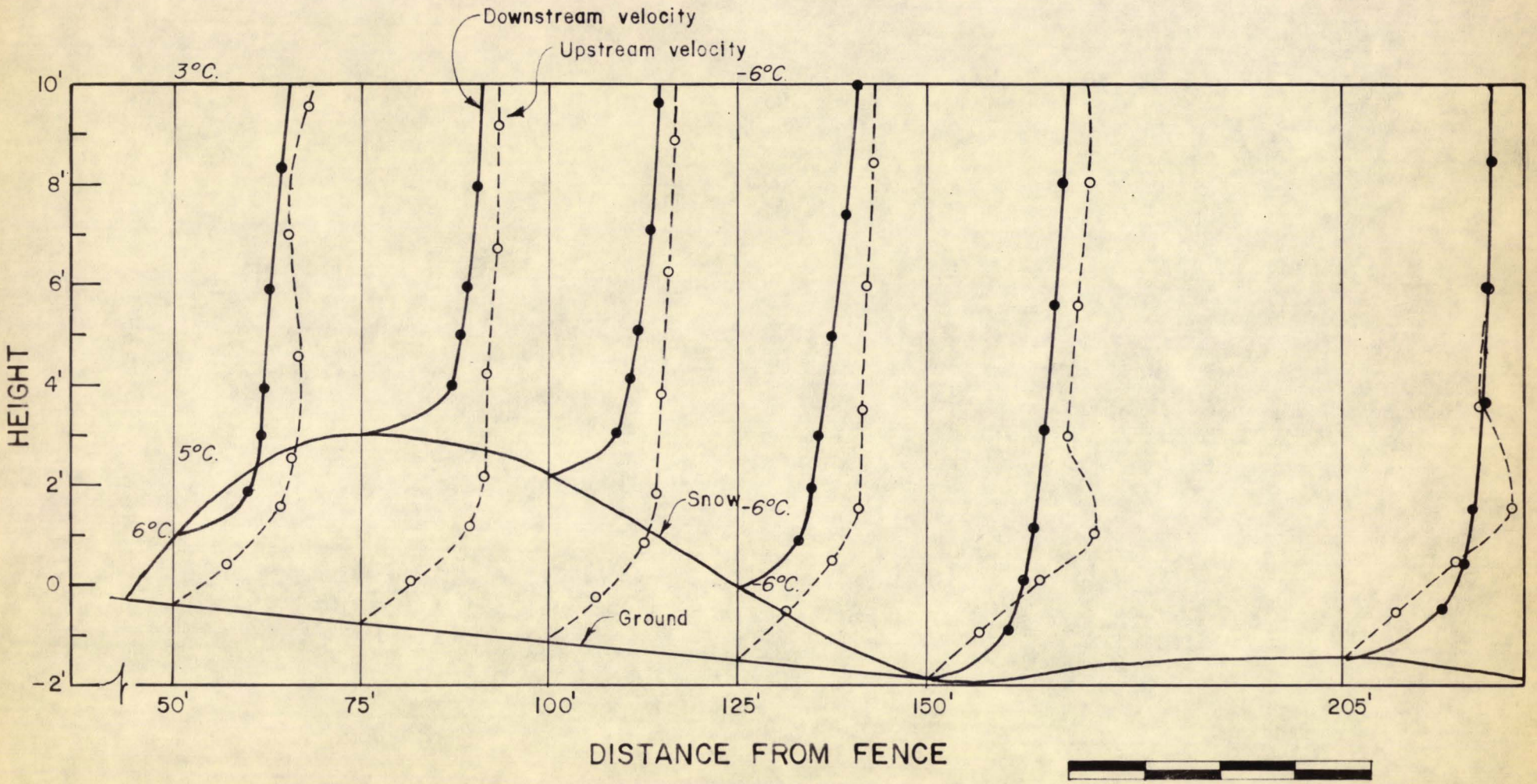
Figure 35



VELOCITY PROFILE

12' FENCE - LOCATION NO. 10

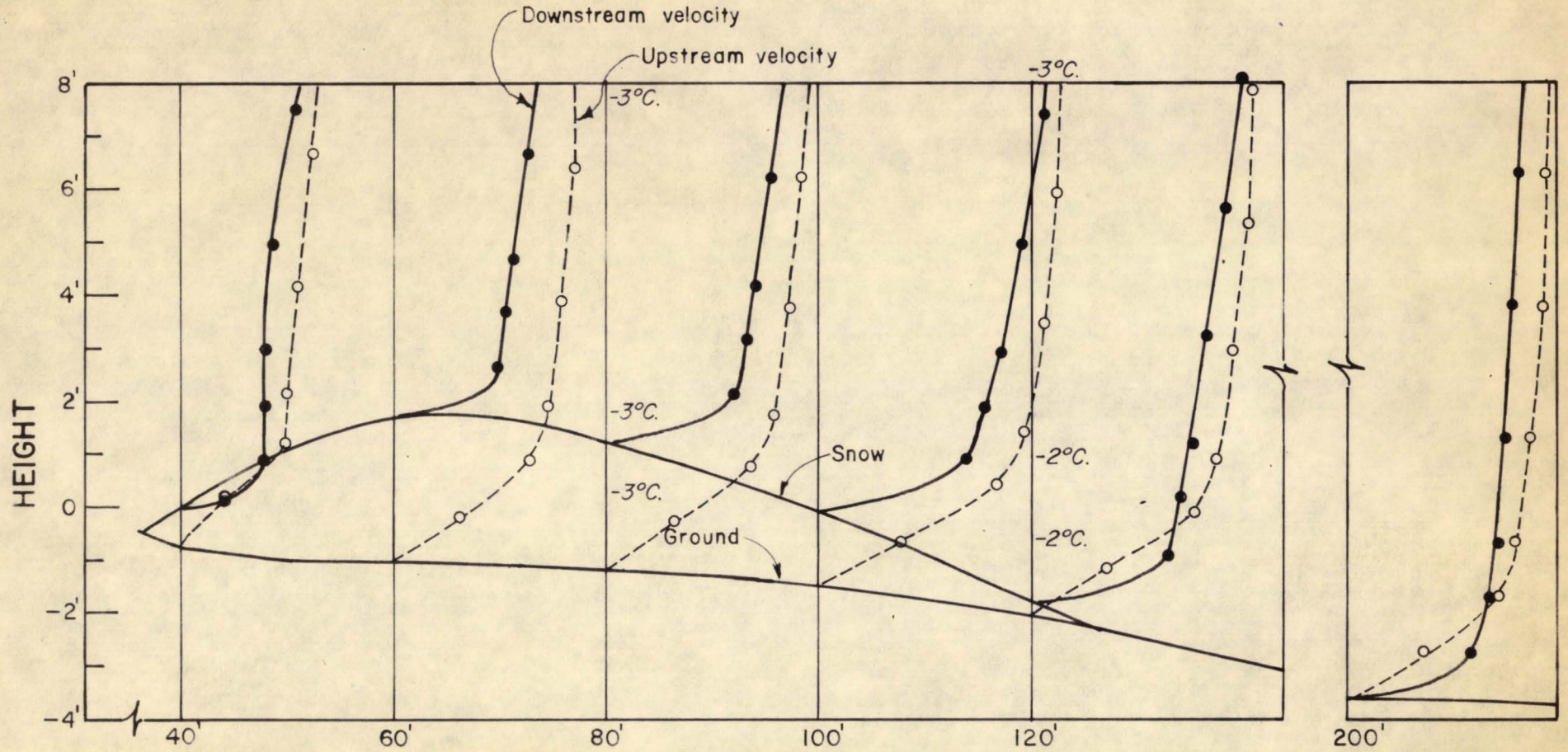
Figure 36



VELOCITY PROFILE

10' FENCE - LOCATION NO. 2

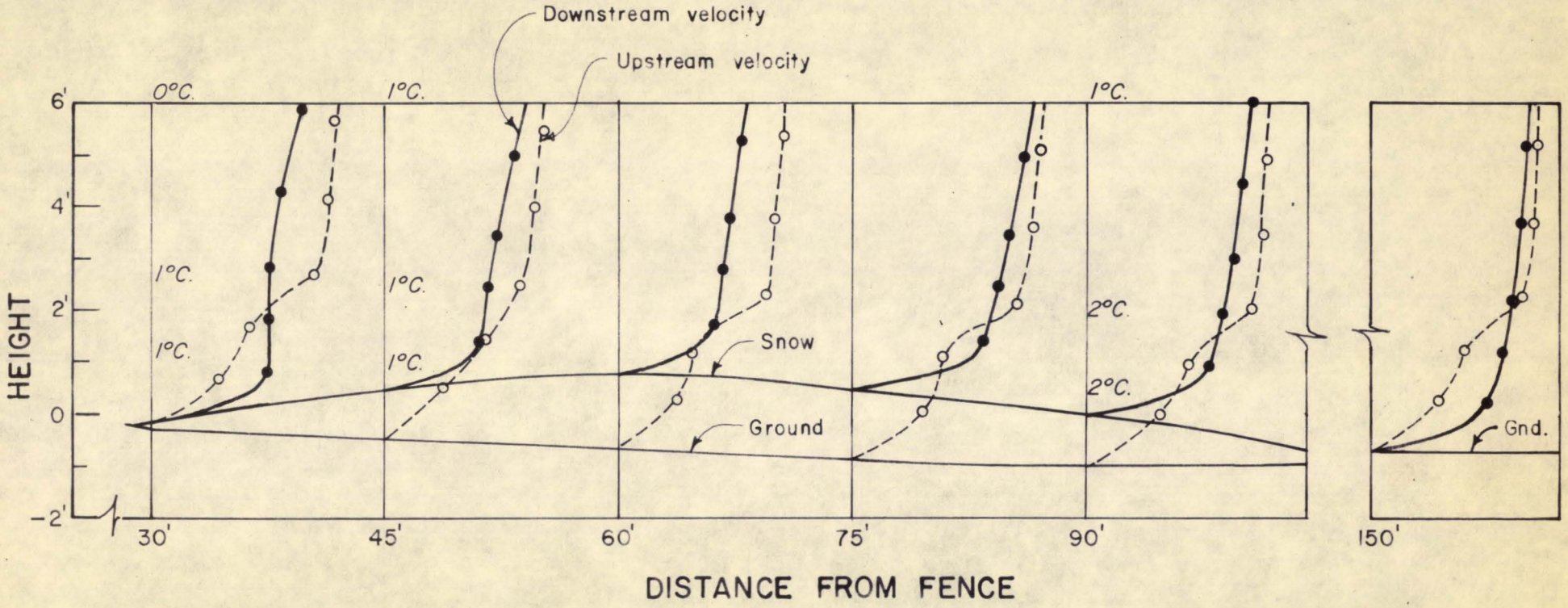
Figure 37



VELOCITY PROFILE

8' FENCE - LOCATION NO. 2

Figure 38



VELOCITY PROFILE

6' FENCE - LOCATION NO. 1

Figure 39